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APPENDIX B

Work Plan

STS CONSULTANTS

750 Corporate Woods Parkway
Vernon Hills, Illinois 60061
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October 1, 2002

Mr. Fred Micke
Ms. Verneta Simon
U. S. Environmental Protection Agency
Region 5
77 W. Jackson Blvd., SE-5J
Chicago, Illinois 60604

Re: Work Plan for Investigation and Removal of Radiologically Impacted Soil, Lakeshore East Site, Southwest Corner of Wacker Drive and Lake Shore Drive, 221 North Columbus Drive, Chicago, Illinois – STS Project No. 1-32193-XA

Dear Mr. Micke and Ms. Simon:

Enclosed please find the Work Plan for the above-referenced site. This Work Plan has been revised in response to your review and comments provided to STS in your letters dated September 4 and September 20, 2002. We have provided three copies for your use and distribution.

Please contact us with any questions you may have regarding the attached Work Plan.

Regards,

STS CONSULTANTS, LTD.

Steven C. Kornder, Ph.D.
Senior Project Geochemist

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: David Carlins, Lakeshore East, LLC (3 copies)
Sean Bezark, Altheimer & Gray (1 copy)
Barbara Magel, Karaganis, White & Magel (1copy)
Mark Krippel, Kerr-McGee Chemical LLC (1 copy)
Glenn Huber, SAHCI (1 copy)
Buster Maxwell, Budron Excavating (1 copy)
Steve Hawks, Hawks Logistics (1 copy)

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Lakeshore East LLC
STS Project No. 1-32193-XA
June 24, 2002
Revised September 13, 2002
Revised September 30, 2002

WORK PLAN FOR INVESTIGATION AND REMOVAL OF RADIOLOGICALLY IMPACTED SOIL LAKESHORE EAST DEVELOPMENT

1.0 INTRODUCTION

This Work Plan was developed for investigation and removal of radiologically impacted soil from the Lakeshore East Development Site (Subject Site). The Subject Site consists of approximately 26 acres located at the southwest corner of Wacker Drive and Lake Shore Drive at 221 North Columbus Drive, Chicago, Illinois (Figure 1). The site is currently developed as Family Golf Centers at Chicago Metro, a golf course and driving range, with associated support buildings, facilities and parking lots. The Subject Site is being investigated as part of a proposed commercial and residential development.

The Work Plan describes the:

- Procedures for managing the removal of radiologically impacted soil above the 7.1 pCi/g cleanup threshold.
- Survey methods proposed for identifying radiologically impacted materials during the grading and excavation activities.
- Closure Report and Documentation of the work activities performed relating to the removal of radiologically impacted soil including health and safety procedures.

Following review and approval of this Work Plan by United States Environmental Protection Agency (USEPA), activities will begin with the removal of the radiologically impacted soils previously identified. Monitoring will be conducted concurrently with the excavation operations. The monitoring activities will be directed toward the identification of radiologically impacted materials within the excavation areas. Radiologically impacted material that is excavated will be transported to a disposal facility licensed to dispose of this material. After completion of the removal activities required by this Work Plan, a report will be prepared documenting the removal activities and indicating the location, if any, of impacted soil identified that will remain on-site. The USEPA will be requested to prepare a "Certification of Completion Letter" acknowledging the completion of the investigation and removal of impacted material. This "Certification of Completion Letter" is requested to acknowledge that conditions at the site are protective of human health and the environment and that no further remediation is necessary.

1.1 Background

Several properties north of the Chicago River in the Streeterville neighborhood of Chicago, Illinois have been found to exhibit evidence of radiological impacts from the former processing of thorium-bearing mineral sands by Lindsay Light and Chemical Company (Lindsay Light) during the 1910s, 20s and 30s. The radiological impacts consist of elevated concentrations of thorium, uranium and their radioactive decay products.

Due to their experience with the Lindsay Light sites the USEPA requested access and conducted a reconnaissance survey of a portion of the Subject Site. That survey identified at least two locations where the gamma radiation levels were anomalously high. Field analysis by USEPA using a portable multi-channel analyzer in areas exhibiting elevated gamma radiation identified uranium and thorium radionuclides consistent with the other Streeterville properties (USEPA correspondence, July 2, 2001).

STS was contracted to investigate the entire 26-acre property to evaluate whether additional locations exhibiting elevated radioactivity might be present, and to attempt to further investigate the USEPA survey results. STS conducted a walkover survey of the entire property on a 5-meter grid. The survey identified locations exhibiting elevated gamma radiation which were consistent with the USEPA findings. Borings, step-out borings, down-hole gamma surveys, and radiological analysis of soil samples were also conducted to document the apparent extent of the radiologically impacted material. The findings of the investigation were summarized in a report dated September 19, 2001, and in an addendum letter report dated October 2, 2001.

The identification of buried radioactive materials from surface surveys is constrained by the presence of soil cover of more that about two feet that can shield radioactive material from detection. The ground surface dating from about the year 1900 was researched to establish the ground surface elevation before the industrial use of the radioactive materials was begun in the site vicinity. The apparent historical site ground surface elevation was evaluated and described in STS's report dated January 2002. Additionally, a fill thickness map was subsequently developed by comparing the year 1900 site grade to the current site topography (STS, February 2002). The resulting fill thickness map identified those areas where the fill over the 1900 ground surface was in excess of 2 feet thick and therefore could potentially mask the presence of radioactive soil from detection by a surface survey. A total of 22 (fill thickness) borings were drilled and numbered 100 through 122 (Figure 2) and were surveyed by down-hole gamma logging for evidence of radiologically impacted soil. The borings ranged from 4 to 10 feet deep and were intended to extend a minimum of 1 foot below the 1900 ground surface elevation.

STS's review of the historical records also identified the presence of several shipping slips on the Subject Site that were filled during a period which was concurrent with the Lindsay Light manufacturing operations. The location of these slips is shown on Figure 2. Borings within the slip areas were drilled on a 10-meter grid over the entire extent of the slips as of the year 1906 to explore the slips for evidence that radiological material may have been included in the fill. A total of 215 borings were drilled to examine the slip areas in January 2002. Borings in Slips C, D, and E are designated with a letter indicating the slip and a number indicating the boring number (i.e., C-1 reflects Slip C, boring 1). The boring layout is also shown on Figure 2. Additionally, a final set of borings, step-out borings, were positioned around those slip borings where evidence of elevated gamma radiation was noted in the down-hole logging of the initial 10 meter grid borings. These step-out borings were for the purpose of identifying the lateral extent of the radiologically impacted soil noted in the slip grid boring.

The results of the additional boring activities conducted in January 2002 are included the STS report of February 8, 2002. All of the fill thickness, slip and step-out borings were surveyed for elevated radioactivity by collecting down-hole gamma measurements. No additional locations exhibiting elevated radioactivity were identified in the borings in the thicker fill areas outside the slips. No elevated gamma readings were noted in the borings drilled in Slip C near the northwest corner of the site. One additional area was identified in Slip E and five additional areas were identified in Slip D.

In summary, based on the results of the investigations previously completed by STS, the radiologically impacted soil appears to be restricted to two localized areas. These areas are within or in close proximity to the former locations of Slips D and E. The volume of impacted soil identified using the data developed, and including several assumptions that would tend to overestimate the amount of impacted soil, resulted in an estimate of 1,136 cubic yards (CY) (STS, February 2002). However, subsequent excavation and grading activities may discover additional soil beyond that identified in the previous explorations. That material may also possibly require removal.

2.0 PROPOSED WORK ACTIVITIES

2.1 General Description

There are three phases of work that comprise the investigation and remediation of the Subject Site. The Initial Investigation and Delineation Phase (Phase I) has already been completed. The Investigation and Delineation Phase started with the survey and sampling work conducted by USEPA and/or STS and reported in the USEPA July 2, 2001 letter report and the STS September 2001, October 2001 and February 2002 reports. A summary of the Phase I results was provided in Section 1.1. The scope of work for Phases II and III comprises the work described in this Work Plan and summarized below.

The Radiologically Impacted Soil Removal Phase (Phase II) will consist of the removal of the radiologically impacted zones identified in the Initial Investigation and Delineation Phase. The Phase I results indicated that with one exception (boring number D-71) the impacted soil was confined to depths less than 10 feet. Therefore, the excavation and removal phase will remove impacted soil above the groundwater table, which is anticipated to be at a depth of 8 to 10 feet at the Subject Site. Removal of impacted material below groundwater, which would include material at depths greater than 10 feet, is not proposed since these deeper materials, if present, are shielded sufficiently by the overlying soil and/or groundwater to minimize the exposure hazard at the ground surface.

If radiologically-impacted material below groundwater will be left at the Site, a groundwater sample of the standing water within the excavation will be collected and analyzed for radiological impact. In addition, the location of impacted material that will remain at the Site will be referenced to surveyed coordinates based on traditional land surveying techniques to facilitate the accurate representation of the material in reports and on drawings.

It is acknowledged that if radiologically-impacted soil remains at the Site following completion of this work, Lakeshore East will work with USEPA regarding the required documentation relative to this residual impacted material. At present, in the absence of knowing whether material will be left, at what location, on private or public property, depth, quantity or activity, determination of the appropriate document is not feasible.

The Subject Site will be graded in preparation for construction activities. The Site-wide Grading and Monitoring (Phase III) will involve radiological surveys of those areas that are covered by greater than 18 inches of post 1900 fill soil as the areas are exposed during the site development grading process.

These post 1900 fill areas are shown on Figure 4. The Phase III activities will involve the grading of fill soils in thin lifts (18 inches maximum), which because of fill thickness, may have shielded the presence of radiologically impacted fill material during the initial surficial survey. Therefore, surficial surveys will be performed throughout the grading process in areas were post-1900s fill soil greater than 18 inches thick is present. Any soil above the cleanup threshold of 7.1 pCi/g total radium will be removed to clean limits, and the impacted location confirmed clean through confirmation surveys and verification sampling by USEPA. The determination that an impacted location has met the clean-up criteria will be made through analysis of soil samples to measure the soil concentration of contaminant radionuclides. A more detailed description of these activities is presented in the following sections.

2.2 Excavation of Radiologically Impacted Soil (Phase II)

It is anticipated that the removal activities will begin with the impacted areas identified in the southern portion of the property within the former Slip E (Figure 4). Removal activities will be completed in the southern area before moving to the northern area. That area will be finished before beginning the site grading phase. Excavation will proceed in two phases, radiologically impacted soil removal (Phase II) and the site-wide grading and monitoring phase (Phase III). Phase II will consist of the removal of the radiologically impacted soil identified through the site walk-over gamma survey and boring programs previously completed and summarized in the STS reports of September 2001 and February 8, 2002. Those soils will be removed to apparently clean limits of 7.1 pCi/g total radium or less. The excavations will be designated Exclusion Zones for purposes of health and safety requirements.

The excavation process will utilize an excavator with a maximum one CY bucket. This bucket size will facilitate loading the transport containers without spilling and/or spreading the contamination. Impacted soil will be loaded directly into transport boxes. Transport boxes will be lined, covered, and sealed, and the exteriors confirmed clean prior to leaving the Subject Site, in accordance with SOP-320 (Appendix B).

At locations where impacted soil is covered by clean soil, excavation will be limited to not more than 18 inches per lift followed by a survey for elevated gamma readings. This restriction is due to the shielding provided by soil, which could preclude detecting impacted soil beneath a soil cover of greater than 18 inches. Excavation will proceed to excavate the impacted soils at the Subject Site. The excavations will proceed to clean limits and will be confirmed by surveys conducted during the excavation process. Once the confirmation survey has confirmed the absence of radiologically impacted soil (SOP-210), the excavation will be subject to verification survey and sampling by USEPA, in accordance with Section 3.2.3 of this Work Plan (SOP-223 and SOP-214 of Appendix B).

If floor slabs are encountered within the post-1900 fill materials, the slab will be broken and removed and the soil beneath the slab screened for verification and closure by USEPA. Concrete slabs, footings or walls encountered during the excavation will be cleaned of adhering contamination, if any, and after release by USEPA as non-radiologically impacted, will either be removed from the site or stockpiled on-site for subsequent management in connection with site development work.

2.3 Site Grading and Monitoring (Phase III)

The Subject Site will be graded in preparation for construction activities. Phase III will involve the surveying for radioactivity of post 1900s fill soil that, because of fill thickness, may have shielded the presence of a radiologically impacted soil during the Phase I surficial survey. Surficial surveys will be performed as grading proceeds in the areas where the post 1900 fill is in excess of 18 inches thick in accordance with Section 5.7 of SOP-210 (Appendix B). These post 1900 fill areas are shown on Figure 4. All impacted soil will be removed to clean limits. Grading will be limited to lifts of 18 inches or less between surveys.

Former building foundations or buildings with basements built after 1900 have not been identified at the Subject Site. However, if discovered during the grading process, the potential presence of radiologically impacted fill materials below the floor slab or basement floor and any fill materials within the basement will be investigated. For the materials within the basement structure the radiological survey methods will be similar to those used for the excavation process (i.e., investigation in maximum 18 inch lifts through the full thickness of the basement fill). For soil below the floor, the method of investigation will consist of the complete removal of the floor and a subsequent surficial survey. The discovery and subsequent investigation of such structures will be included within the closure report for the Subject Site.

2.4 Construction Monitoring

Radiation monitoring will continue during site development and construction as part of the following activities:

- Utility installation; and
- Foundation excavations in certain areas of the site.

2.4.1 Utilities

The installation or excavation of utilities will occur during the grading and subsequent construction phases. Utility excavations will be screened for the presence of radiologically impacted materials when the utility activities are proposed for areas containing post-1900 fill materials which have not been previously surveyed. These areas will be limited to the shipping slip areas shown on Figure 1.

These surveys will be conducted following the methodology for excavation of apparently clean soil in Sections 2.2 and 2.3. Excavation will be limited to not more than 18 inches. All impacted soils will be removed to clean limits or to the depth of groundwater, which is anticipated to occur at a depth of about 10 feet. Areas containing impacted soil above the 7.1 pCi/g cleanup threshold will remain designated as Exclusion Zones until the area is verified clean by USEPA. Work within any utility installation area designated as an Exclusion Zone will require appropriate personal protective equipment (PPE) and personal air monitoring. Personnel entering Exclusion Zones must be 40-hour health and safety trained. All equipment and personnel that enter an Exclusion Zone will be frisked clean upon leaving the area.

2.4.2 Foundations

Drilled or excavated foundations may be installed in post-1900s fill materials, and will be screened for radioactivity during the grading and subsequent construction phases. Spoil from drilled foundations will be screened for the presence of radiologically impacted materials when the drilling activity is proposed for an area containing post-1900 fill material, such as in the slip areas. Radiological surveying will be limited to these fill materials. Natural soil excavation and drilled spoil will not be surveyed for radioactivity. Spoil materials exhibiting a radiological impact above the 7.1 pCi/g cleanup threshold will be managed for disposal according to Section 3.3. The closure report will provide the location, if any, of impacted material identified during these drilling activities that will remain on-site.

Foundation excavations will be screened for the presence of radiologically impacted materials if the excavation activities are proposed for areas containing post-1900 fill materials. These surveys will be conducted following the methodology for excavation of apparently clean soil in Sections 2.2 and 2.3. Excavations will be limited to not more than 18 inches between surveys. (Note that the 18 inch limit will not apply to any caisson or other drilled foundation elements due to the construction methods for such features.) Impacted soils will be removed to clean limits or to depth of groundwater (i.e., about 10 feet). Areas containing material above the 7.1 pCi/g cleanup threshold will remain designated as Exclusion Zones until the areas are verified clean by USEPA. Work within an area designated as an Exclusion

Zone will require appropriate personal protective equipment (PPE) and personal air monitoring. Personnel entering Exclusion Zones will be 40-hour health and safety trained and all equipment/personnel will be frisked clean on leaving the area.

3.0 METHODS

3.1 Cleanup Threshold

The USEPA has set the cleanup level as 5 picocuries per gram (pCi/g) total radium (Ra-226 and Ra-228) above the background. A level of 2.1 pCi/g total radium is currently considered background for the area by the USEPA. Thus, radiologically impacted material is defined by the USEPA for the Streeterville area as exceeding a threshold of 7.1 (pCi/g) total radium.

Field measurements will be taken of gamma radiation levels using a Ludlum 2221 rater-scaler and a 2 x 2 NaI detector. The equipment will be calibrated to determine the gamma count in counts per minute (cpm) that is equivalent to 7.1 pCi/g. Equipment calibration will be performed using the thorium calibration blocks at the Kerr-McGee West Chicago Rare Earth Facility.

Field measurements of gamma counts will include the following:

- Surveys of excavation as clean overburden is removed;
- Surveys of excavation as radiologically impacted soil is removed;
- Surveys of excavations to document all impacted soil has been removed;
- Surveys of Phase III grading as 18-inch lifts are removed;
- Surveys of utility or foundation excavations; and
- Surveys of deep foundation excavations or drilling spoil.

3.2 Surveys, Sampling, and Analysis

3.2.1 Confirmation Surveys

Confirmation screening surveys will be conducted during the excavation of fill materials previously identified as radiologically impacted in the STS reports of September 19 and October 2, 2001 and February 8, 2002. Excavated locations will be screened in accordance with SOP-210 (Appendix B). Since evidence of radiologically-impacted soil in excess of the 7.1 pCi/g cleanup threshold has been identified, these areas will be designated as Exclusion Zones. As described in the Health and Safety Plan (HASP) and discussed briefly in Section 4.0, the Exclusion Zones will require appropriate personal protective equipment (PPE) and personal air monitoring to enter. All equipment and personnel that enter an Exclusion Zone will need to be frisked clean upon leaving the Exclusion Zone. Personnel entering Exclusion Zones must be 40-hour health and safety trained. The surveys will be conducted using a Ludlum 2221 rater-scaler and a 2 x 2 NaI gamma detector.

The areas of potentially impacted soil that have not been documented as clean will be surveyed in place. Excavation will proceed in lifts not to exceed 18 inches in thickness. If an increase in gamma radiation is noted on the order of twice background values, excavation will proceed in thinner lifts to minimize the potential for mixing clean and radiologically-impacted soil. Excavation will proceed through the potentially impacted fill material using an excavator with a maximum bucket of one CY. This bucket size will facilitate loading the transport containers without spilling and spreading the radiologically impacted soil contamination. The subsample locations will be obtained by dividing the 100 m^2 area (10-meter x 10-meter) into four equal quadrants of 5-meters x 5 meters. Four of the subsamples will be collected from the center of the 5-meter x 5-meter quadrants. The fifth subsample will be obtained from the center of the 10-meter x 10-meter sample area. Sample collection will be in accordance with SOP-214.

Once the confirmation screening indicates the absence of radiologically impacted material above the cleanup threshold, samples will be collected over a maximum 100 m^2 area for confirmation analysis at a laboratory. Five subsamples will be composited to develop the sample for each 100 m^2 area. Analysis will be either by NUTRANL or gamma spectroscopy. After confirmation analysis shows the area to be clean, the area will be subject to verification surveys and sampling by USEPA, in accordance with Section 3.2.3 of this Work Plan. The excavations will not be backfilled until a signed radiological verification closure form is received from USEPA.

Soil screening during the course of the excavation activities is also intended to minimize the incorporation of clean material in that which is designated for disposal. Soil indicative of levels below 7.1 pCi/g total radium by the confirmation screening process prior to excavation will be staged for potential use as backfill. As previously indicated, excavation will proceed using an excavator with a maximum 1 CY bucket. This bucket size will also allow the excavated soil to be screened a second time before being placed on the backfill pile. This potentially non-impacted soil will also be subject to verification surveys and sampling by USEPA, if requested, in accordance with SOP-214 (Appendix B) and Section 3.2.3 of this Work Plan.

Imported fill soil will be tested to confirm it meets the criteria specified in Specification 02200, Section 2.E. Material will be tested for radioactivity (less than 3.7 pCi/g), engineering classification per ASTM D2487, and Standard Proctor per ASTM D698. One series of tests will be performed for each 10,000 cubic yards from a single borrow source. One series of tests will be provided for each borrow source at a minimum.

Prior to the initiation of Phase II or Phase III activities, gamma count rate background levels shall be established for each applicable survey instrument. Six locations shall be chosen in non-radiologically impacted areas of the Site. A one-minute integrated count shall be obtained at the surface of each location, for each survey instrument (Ludlum 2221 with 2" x 2" NaI probe). The measurements collected from each location shall be averaged to establish instrument specific background gamma count rates.

In order to establish background gamma dose rates, a measurement shall be obtained at one meter above the surface of each of the six background locations. A Ludlum Model 3 with attached 1" x 1" NaI probe will be used to record the uR/hr reading at each location. The measurements shall be averaged to establish a background gamma dose rate for the Site.

3.2.2 Surficial Walk-over Surveys

Surficial survey methods were used in Phase I of this project to initially identify the presence of radiologically impacted materials. This same technique will be used during Site-wide Grading and Monitoring (Phase III) to survey for the presence of contamination. Additionally, those areas currently covered by pavement and/or buildings that precluded the survey of exposed soil, will be subject to walkover surveys. If necessary, paving stones, asphalt, concrete and the associated subgrade will be removed prior to conducting the surficial survey. A grid with a 5-meter spacing will be marked by stakes and flagging at the edges of the project area or by paint on the ground surface on the interior of the site. The areas between the grid points will be scanned so as to cover 100 percent of the intra-grid areas.

The surveys will be conducted using a Ludlum 2221 rater-scaler and a 2 x 2 NaI gamma detector. The detector will be unshielded to provide for a broader screening area in assessing the surface survey. Values will be recorded in counts per minute (cpm). The maximum value will be recorded for each grid cell and all anomalously high areas (2 times background) will have the approximate limits designated on the survey data sheets. The locations will be marked in paint on the ground surface. Field screening data sheets will include recording the instrument serial number, calibration date, operator, and site grid coordinates surveyed. A copy of a field data sheet is attached (see Appendix A).

Locations with elevated gamma counts (twice background) will be marked to identify the limits of the elevated readings. Those areas which exceed the USEPA cleanup level, gamma counts indicative of material exceeding 7.1 pCi/g total radium, will be designated as Exclusion Zones. Work activities within the Exclusion Zones will be conducted in accordance with the procedures outlined in the HASP and briefly summarized in Section 4.0.

Additional documentation of contaminant levels may be performed through the collection of samples for laboratory analysis using high resolution gamma spectroscopy analyses. Gamma spectroscopy samples will be collected in 500 ml Marinelli beakers and submitted to a subcontract laboratory for analysis. These samples may be collected to: a) document where removal is necessary; b) indicate areas where removal has been successful; c) document areas that are below the USEPA threshold level as indicated by the NaI detector; or d) to confirm the levels of radiological contamination that will remain on-site outside the designated excavation areas.

3.2.3 Verification Sampling

As previously indicated, soil exhibiting contamination above the clean-up threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228) will be removed, placed in transport boxes and shipped to a disposal facility licensed to receive this material. Excavated locations will be screened in accordance with SOP-210 (Appendix B). To demonstrate to the USEPA that the floors and sides of soil excavations meet cleanup criteria specified by USEPA, a verification/field sampling program must be implemented following the excavation of the radiologically-impacted materials. The verification survey sampling program will be conducted in general accordance with SOP-223 and SOP-214 (Appendix B).

The excavations will not be backfilled until a signed radiological verification closure form is received from USEPA. Initial field demonstration that the location has been excavated to clean limits will be made with a shielded 2 x 2 NaI detector. Pre-verification samples will then be collected and analyzed using NUTRANL software and gamma spectroscopy analyses. It is anticipated that the NUTRANL software and gamma spectroscopy analyses will be conducted at an off-site (fixed) laboratory. This fixed facility will be at a temporary laboratory established in the vicinity of the Lakeshore East site and will be supervised by Mr. Glenn Huber of Stan A. Huber Consultants, Inc. of New Lenox, Illinois. Samples may also be sent for high resolution gamma spec analysis to a subcontract laboratory operated by RSSI in Morton Grove, Illinois. The laboratory data package will include chain-of-custody copies, sample receipt and tracking forms, preparation and analysis logbooks, raw data forms, tabulated data summaries, calibration records, and standards, QC sample results, and any corrective action reports (refer to SOP-364 in Appendix B). Gamma spec analysis will be conducted using a Library Energy Tolerance of 1.2 keV and a Gamma Fraction Limit of 71%.

The option to use a temporary field laboratory for generating the gamma spectroscopy verification data could be utilized if rapid turn-around of results becomes critical to the project. Field lab verification results would be provided in two forms. The initial NUTRANL data set will consist of one set per sample and will include the radionuclide concentrations and error limits for uranium 238, thorium 232, radium 226, and potassium 40; the sample number; date and time sampled; laboratory number (sequential); identify the analyst; and analytic method (NUTRANL). The second field lab data form will be a consolidated spreadsheet with all analysis in sequence by laboratory number. This table will include the sample number, data and time sampled, radionuclide concentrations and error limits for the four NUTRANL analytes, and a line totaling the thorium and radium concentrations. The field laboratory will also maintain a copy of the chain-of-custody for those samples received and analyzed.

3.3 Materials Management

Activities to manage removed material include all actions taken from the time the material is excavated until it reaches its final destination. Materials that are removed from the property may be replaced in their original locations, placed in another location on the property, salvaged, or sent to a local landfill if the materials meet the radiological clean-up criteria of 7.1 pCi/g total radium. Materials that do not meet the radiological cleanup criteria will be sent to an approved disposal facility.

At present, it is anticipated the radiologically-impacted material will be sent to EnviroCare of Utah, located in Clive, Utah. Shipping and placarding will be in accordance with all Department of Transportation regulations for shipping radiologically-impacted material. Permitting for disposal at EnviroCare will be arranged before any impacted material is loaded for shipment.

Trash and debris that is not radiologically-impacted and is designated to be removed from the site will typically be placed into clean roll-off containers provided and collected by licensed trash removal and disposal companies. Radiologically-impacted materials will be transported between the Subject Site and the approved disposal facility according to DOT regulations. Procedures which will be used with respect to radiologically-impacted materials to minimize the potential for and effects of spills and accidents during transport of such radiologically-impacted materials include but are not limited to the following:

- Drivers will have the proper licenses, training, and certifications for transporting potentially radioactive materials.
- Trucks transporting low-level radioactive materials in excess of 7.1 pCi/g total radium will have sealed or lined containment. Covers for the roll-off containers will be placed over the load prior to exiting the contaminated area. Covers will be fastened down tightly to prevent materials from being blown out of the containers. This will minimize the escape of materials should an accident occur. Empty containers returning to the site will also have covers. Trucks will carry all

necessary papers and placarding. Containers will be inspected prior to loading to determine suitability.

- Contaminated vehicles and equipment will be decontaminated first using broom cleaning to remove all adhering surface dirt. As needed, pressurized water spray will be used for further decontamination. Water generated during decontamination will be contained and evaporated, used for dust control on contaminated soils designated for disposal, or possibly sent for disposal at an approved disposal facility.

- Prior to transporting excavated soils or other materials, all transport equipment will be frisked. Frisking will include tires and fenders and the sides and back of the bed. Frisking the cabs of trucks will not be necessary unless loading has been over the front of the truck.

- Travel between the property and the rail terminal will be only on specified routes selected to minimize the potential for and the effects of any accidents.

Two types of material will be distinguished in the excavation process: radiologically-impacted soil exceeding the clean-up threshold of 7.1 pCi/g total radium, and excavated soil suitable for backfill that is not radiologically impacted in excess of 7.1 pCi/g total radium. There also may be materials that will be specified by the owner as unsuitable for backfill, based on engineering properties, non-radiological impacts, or other specifications. For this Work Plan, a distinction is proposed for radiologically-impacted materials and non-radiologically impacted materials. Disposal of non-radiologically impacted materials at an off-site location will comply with all applicable laws and regulations.

Soil that, based on visual or olfactory observations, is suspected to be grossly impacted by non-radiological contamination will be temporarily staged on-site to allow for proper sampling and characterization for disposal. These soils will be placed on liners and will be covered to minimize potential for erosion and spread of the material.

Radiologically-impacted soil excavated in Phase II will be loaded directly into containers (either "Baker Boxes" or "Supersacks"). In Phase III, the anticipated quantities of material exceeding the radiological cleanup standard of 7.1 pCi/g total radium at individual locations may not fill a "Baker Box". If that is case, soil exceeding the radiological cleanup level will be temporarily stored in "Supersacks" until enough has accumulated to warrant delivery of a "Baker Box". Where locations are encountered during Phase III where significant quantities of radiological material require removal, direct loading of containers will be resumed.

3.4 Data Management and Report

Data management for the site consists of site safety and training records, health physics data (i.e., air monitoring and personnel monitoring data), soil radioactivity field and laboratory data, shipping and transport records, and civil construction and excavation data (i.e., land surveys, excavation volume estimates, etc.). A vicinity or local laboratory will be used to analyze soil samples as excavation and removal proceeds, and for pre-verification sampling that the radiological clean-up criteria have been met. Analytical records will be kept at the site and at the STS office in Vernon Hills, Illinois. Air monitoring analyses will be maintained at both the site and the STS office, and will be transmitted with the monthly project progress reports to USEPA.

Monthly progress reports will be submitted to USEPA beginning 30 days after USEPA's review and approval of this Work Plan, and will be submitted monthly by the 15th of each month until termination of the UAO as applicable to this site, unless otherwise directed by the USEPA On-Scene Coordinator (OSC). These monthly reports will describe all significant developments during the preceding period, including the work performed, and any problems encountered, analytical data received during the reporting period, and developments anticipated during the next reporting period, including a schedule of work to be performed, anticipated problems, and planned resolutions.

3.5 Exclusion Zone Access and Security

Access by unauthorized personnel to the Exclusion Zone excavation areas will be controlled during operational and non-operational hours because of hazards created by open excavations, moving contractors' equipment, and traffic. Only authorized personnel will be permitted within the fenced area. Exclusion Zone access will be directed by the Project Coordinator, Field Team Leader or their designated representative (see HASP). The excavation work area will be fenced with a temporary chain-link fence unless the access is restricted by fencing at the site perimeter. In the case of a perimeter fence, access to the excavation areas will be restricted through the use of temporary fencing (i.e., plastic barrier fencing). This fencing will include appropriate signage to provide security during non-operational hours. Access gates/points will be closed when not in use.

During operational hours, the project management consultant, its contractors and subcontractors, and their representatives will have access to the excavation area to implement the excavation activities. The party responsible for radiological soil transport and their contractors and subcontractors will have access to implement health physics and transportation activities. Information on restrictions to the excavation areas, and various signs and barricades, will be disseminated during the project kick-off meeting held at the beginning of the project.

All visitors desiring access to the excavation area will be required to register with the Project Coordinator or his designee. The Project Coordinator or his designee will provide necessary orientation and training, provide radiation monitors as appropriate, and escort the visitors. The visitors will be required to observe all health and safety requirements and follow all instructions given by the Field Team Leader.

Regulatory and governmental officials who visit the excavation areas regularly will be requested to notify the Project Coordinator or the Field Team Leader. They will be required to comply with all Health and Safety rules.

During non-operational hours, barricades, beacons, radiation warning signs, and temporary fencing, as appropriate, will be placed to prevent unauthorized entry into an Exclusion Zone. Exclusion Zones will be surrounded with magenta and yellow rope and stakes or fence posts until determination that it meets the USEPA cleanup threshold. Signs will be placed on the excavation area perimeter fencing identifying the area as a construction area and prohibiting unauthorized entry. The warning signs will be installed at maximum 100 foot intervals on the perimeter fence.

3.6 Decontamination

All discarded materials, waste materials, and other field equipment and supplies shall be handled in such a way to prevent the potential spread of contamination during excavation and restoration activities. Discarded items that have contacted contaminated materials will be containerized and stored for disposal at the approved disposal facility. Non-contaminated items to be discarded will be collected for disposal as general refuse waste. Personnel and sampling equipment decontamination are described in the Decontamination Procedure included as SOP-347 of Appendix B.

4.0 HEALTH AND SAFETY PLAN SUMMARY

A project specific HASP is provided under separate cover. Site surveys, excavation and remediation activities will be conducted in accordance with the site HASP. Additionally, reference is made to the following documents included within Appendices B and C:

- Dust Control Plan
- SOP-210 – Gamma Radiological Surveys
- SOP-217 – Excavation Procedure
- SOP-223 – Verification Survey Procedure
- Construction Health and Safety

The HASP addresses required training, personnel protection equipment, general work precautions, and medical monitoring among other issues. In general, as contamination is detected, either by the initial surface survey or in the course of monitoring the excavations, the areas will be designated with a magenta and yellow rope and stakes or fence posts. These areas will be designated Exclusion Zones, and will require appropriate personal protective equipment (PPE) and personal air monitoring to enter. All equipment and personnel that enter an Exclusion Zone will need to be frisked clean upon leaving the Exclusion Zone. Personnel entering Exclusion Zones must be 40-hour health and safety trained.

All accidents or injury "near misses" will be documented and communicated to the Project Coordinator and Field Team Leader in a timely manner. Project safety briefings will be held on a weekly basis, and project tailgate meeting will be held on a daily basis as a regular part of project communication between the Field Team Leader and project contractors and subcontractors.

4.1 Key Personnel

While health and safety will be the concern of every person on the job, the radiation survey and soil excavation management team will be responsible for the implementation of the HASP. These persons are the Project Coordinator, Health and Safety Officer and the Field Team Leader. Figure 3 presents the project management work organization chart. The responsibilities for these positions are detailed in the HASP. Radiation laboratory subcontract services will be provided through Radiation Safety Services, Inc. (RSSI).

4.2 Potential Hazards

Potential hazards that could be encountered during the removal activities include contaminated materials and the hazards associated with construction work. Contaminants of concern include the entire decay series for U-238 and Th-232. Radiological and air monitoring as described in this Work Plan will be performed during excavation to define the presence of radiological contaminants.

The mechanisms for exposure to the radiologically-impacted soil material are direct exposure, inhalation, ingestion and eye/skin contact. The primary mechanism of exposure is direct exposure to external gamma radiation. All workers will be instructed in appropriate measures to protect against exposure to the above materials, and PPE will be worn until monitoring shows such is not necessary.

Physical hazards which might be encountered at this site include but are not limited to the following:

- Construction equipment (front-end loaders, back-hoes, trucks, compactors, bulldozers);
- Power tools (saws, drills, jack hammers, compactors);
- Heat and cold stress;
- Overhead power lines;
- Excavations;
- Confined space;
- Noise;
- Demolition of structures;
- Slip, trip and fall conditions, especially during wet or freezing periods; and
- Buried utilities.

For this project, "utilities" include natural gas, water, sewer, communication, cable television lines, and electrical power distribution systems. Prior to the physical site survey, city and utility company records concerning location and construction of utilities on and in the general vicinity will be reviewed and consolidated on a single Utility Plan Drawing. The appropriate utility companies or their designees will be asked to verify the location by originating a request through the Chicago Utility Alert Network (DIGGER) phone number: 312-744-7000, and through application to the Chicago Board of Underground.

The locations of the identified utilities will be "ground-truthed" by observing the locations of power and phone poles, above-ground transformers (where electrical distribution lines are below ground), manholes, water meters, natural gas meters, phone boxes, surface indications such as utility vaults, catch basins, and surface depressions which can occur over utility trenches, and the locations marked by the utility companies or their representatives. Procedures for working in the vicinity of utilities and repair to damaged utilities will be discussed with the excavation contractor crews. All work on and in the vicinity of utilities will be in accordance with City and utility company specifications.

Additional details on these and other safety provisions are addressed in the HASP.

4.3 Training and Communications

Site and project specific radiation and health and safety training will be provided for all on-site personnel prior to work on the Subject Site. All personnel required to work in the Exclusion Zone or Contamination Reduction Zone shall complete training conforming to the requirements of 29 CFR 1910.120(e) including 40 hours of initial hazardous waste site worker training. Where appropriate, they shall have 8 hours of annual refresher training, and 8 hours supervisors training. Field personnel shall complete radiation safety training in compliance with 32 IAC 400. This training shall include, at a minimum, 4 hours of training pertaining to radiation safety and awareness. Training will be conducted by a qualified safety specialist and/or a qualified senior health physics technician, at a minimum. The project training program is included in HASP. As noted in the HASP, Federal safety requirements take precedence over state requirements.

All site personnel will be trained and briefed on radiation basics, anticipated hazards, equipment to be worn, safety practices to be followed, contamination prevention practices, emergency procedures, radiation basics and communications. Procedures for leaving a contaminated area shall be planned and implemented prior to going on-site. Work areas and decontamination procedures will be established based on expected site conditions, and updated as necessary during construction. Other guidelines such as heat and cold stress, excavation safety and confined space are included within the HASP.

In addition to this formal health and safety training, "tailgate" safety meetings will be held weekly, or more frequently, dependent on safety issues arising during the project. These meetings may be led by the worker's foremen and every employee must sign in before beginning work for the week. The subject covered and persons present will be recorded for each meeting and kept as part of the project records. Health and safety incidents and monitoring results will be discussed in the tailgate safety meetings, when appropriate.

Visitors to the site will be briefed on the requirements of the HASP before being allowed within the work area, and will be accompanied by a foreman or supervisor whenever possible.

4.4 Personnel Protective Equipment

Based on information from previous investigations of site conditions, radiologically impacted soil removal will be necessary. All personnel operating in Exclusion Zones will be required to have personal air monitors (PAMs). Disposable coveralls, steel-toed work shoes, boot covers, hard hat, safety glasses and gloves will also be required in all Exclusion Zones. Prior to exiting any Exclusion Zones, personnel will go through decontamination, disposal of all appropriate PPE, and frisking procedures as described in the HASP.

4.5 Air Quality Monitoring

The principal objectives of the air monitoring activities are to:

- Ensure worker and general population safety and provide radiological control information;
- Evaluate work procedures and site control measures. In addition to identifying the need for corrective action, air monitoring also documents the effectiveness of such control actions; and
- Measure releases of airborne radioactivity (should any occur) and ensure that people living and working in the surrounding area are not exposed to radiation above acceptable limits.

A primary requirement of dust control is "no visible dust" during activities associated with contaminant removal. The excavation, remediation and soil handling areas where impacted soil is present will be required to have no visible dust. Fugitive dust generation is caused by a range of activities including excavation, loading, dumping, transporting and scraping using heavy equipment such as bulldozers, front-end loaders, trucks and graders. Air monitoring will be conducted for the purpose of documenting and, if detected, initiating measures to control airborne contamination. Air monitoring will be conducted at both site and personnel levels. During the excavation and handling of radiologically-impacted materials, the procedures to be followed to control dust will include traffic speed control and use of covered stockpiles. Where possible, excavated contaminated materials will be loaded into the transport containers the same day they are excavated. Any radiologically-impacted material stored on-site will be either in containers or in Supersacks if there is not sufficient material to mobilize a container. Stockpiled clean materials, including excavated and imported borrow material, will be piled to minimize dust generation. Additionally, the covering of vehicles transporting borrow material will be required. If these initial efforts appear to be inadequate to control dust, water will be applied during the course of excavation and restoration activities as directed by the Field Team Leader to prevent, mitigate or reduce dust resulting from excavation activities. The Dust Control Plan (Appendix C) provides additional detail on the control measures that may be implemented at the site.

4.5.1 Personnel Exposure Monitoring

All personnel operating in Exclusion Zones will be required to have personal air monitors (PAMs). Procedures for personal air monitoring are discussed in the HASP and SOP-212 (Appendix B). Lapel samplers worn for personal air monitoring will be utilized for airborne radioactivity monitoring. Air filters will be analyzed on a daily basis and additional evaluation of samples will be performed when determined necessary based on elevated results. Procedural changes or control measures, such as wetting of soils, will be employed prior to the prescription of respiratory protective equipment.

4.5.2 Perimeter Monitoring

Site perimeter monitoring will be conducted with high volume air samplers at the four sides of the site (north, south, east, and west). This monitoring will be at the property boundary or no more than 200 feet from the limits of the areas anticipated to be excavated. This air monitoring is for the purpose of documenting, and if detected, initiating measures to control off-site airborne contamination. Air monitoring will be conducted in accordance with the Air Monitoring Procedure, SOP-212 in Appendix B. Air filters will be evaluated on a daily basis for gross alpha activity. Comparisons will be made to 10 CFR 20, Appendix B, Table I and II to ensure that adequate radiological controls are in place for workers and the general public. Unless Illinois regulations are more stringent, 10 CFR Part 20, Standards for Protection Against Radiation shall be complied with. In such cases where Illinois regulations are more stringent, 32 IAC Section 340 shall be utilized.

5.0 CLOSURE DOCUMENTATION

An objective of the Work Plan is to document the identification, handling, and disposal of radiologically impacted soil encountered during construction activities at the Lakeshore East Site. The following types of data will be generated during the project:

- Surface gamma survey records
- Soil sampling records
- Soil sample field laboratory data
- Fixed laboratory soil analyses data (USEPA contract and STS subcontract laboratories)
- Air quality sampling records
- Air quality analytical data

The results of the Work Plan investigation and the removal work will be presented in a final closure report. The closure report will provide a summary of the locations of impacted material identified during the project, areas remediated, and identify any known areas where impacted soil remains on-site, if any. The report will include field data, laboratory results, documentation of the volume of material removed and its disposal location. The report will present the information as the basis for and will request issuance by USEPA of a "Certification of Completion Letter" for the Lakeshore East Site. The final closure report will be submitted within 60 days of completion of the on-site investigation and removal work.

6.0 REFERENCES

STS (February 8, 2002) Lakeshore East Additional Radiation Survey Investigation, Chicago Illinois, STS Project No, 1-32193-ZH.

STS (October 2, 2001) Addendum to Report: Results of Expanded Gamma Radiation Survey, 26-Acre Site, Chicago, Illinois—STS Project No. 1-32193-XH.

STS (September 19, 2001) Radiation Survey, 26-Acre Site, Southwest Corner of Wacker Drive and Lake Shore Drive, Chicago Illinois, STS Project No, 1-32193-XH.

PROJECT MANAGEMENT ORGANIZATION CHART

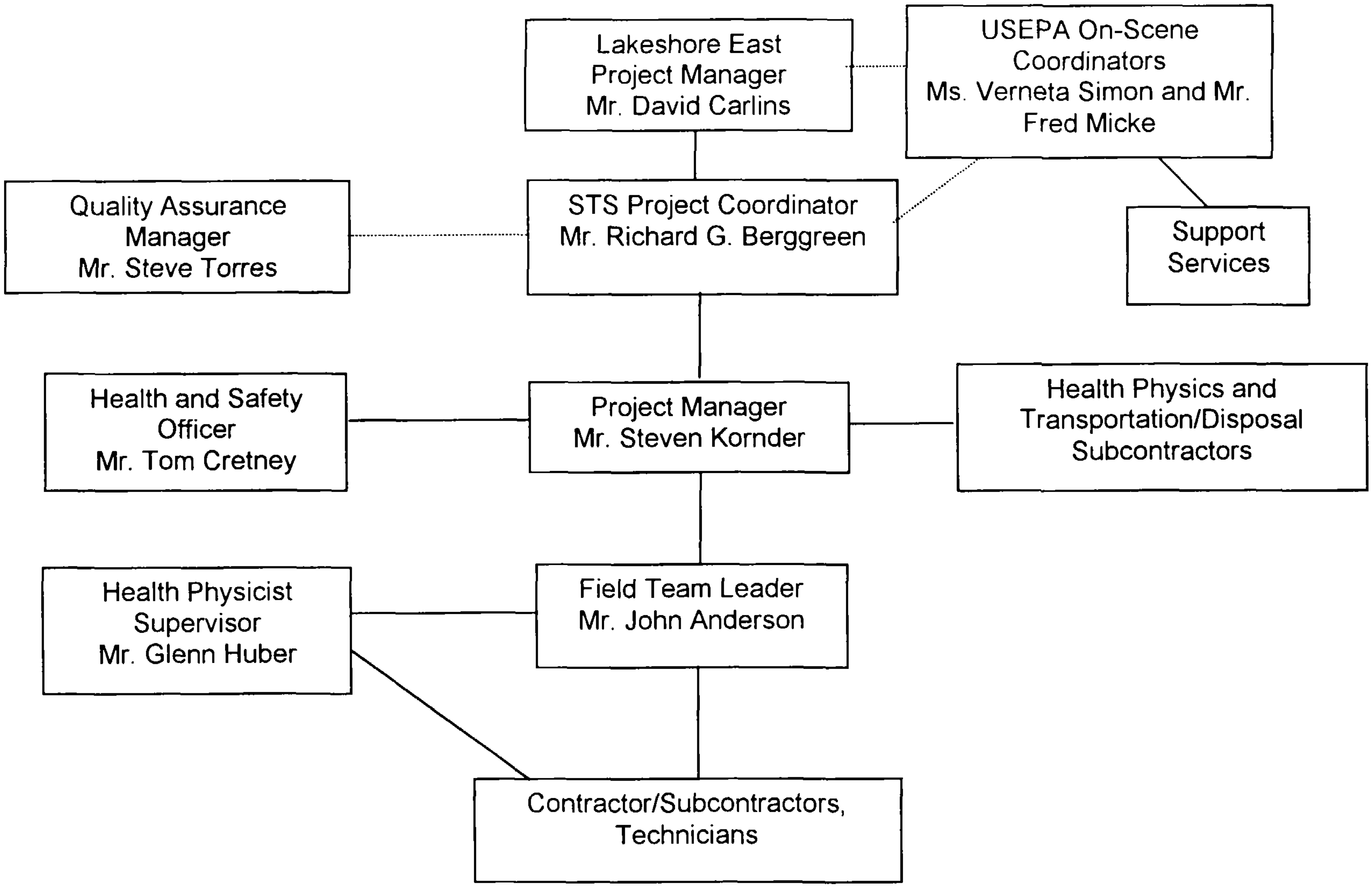


Figure 3

Appendix A

Field Gamma Survey Forms

RADIATION SURVEY FORM - GENERAL

Project # ____________ Project Name ________________ Sheet _____ of _____

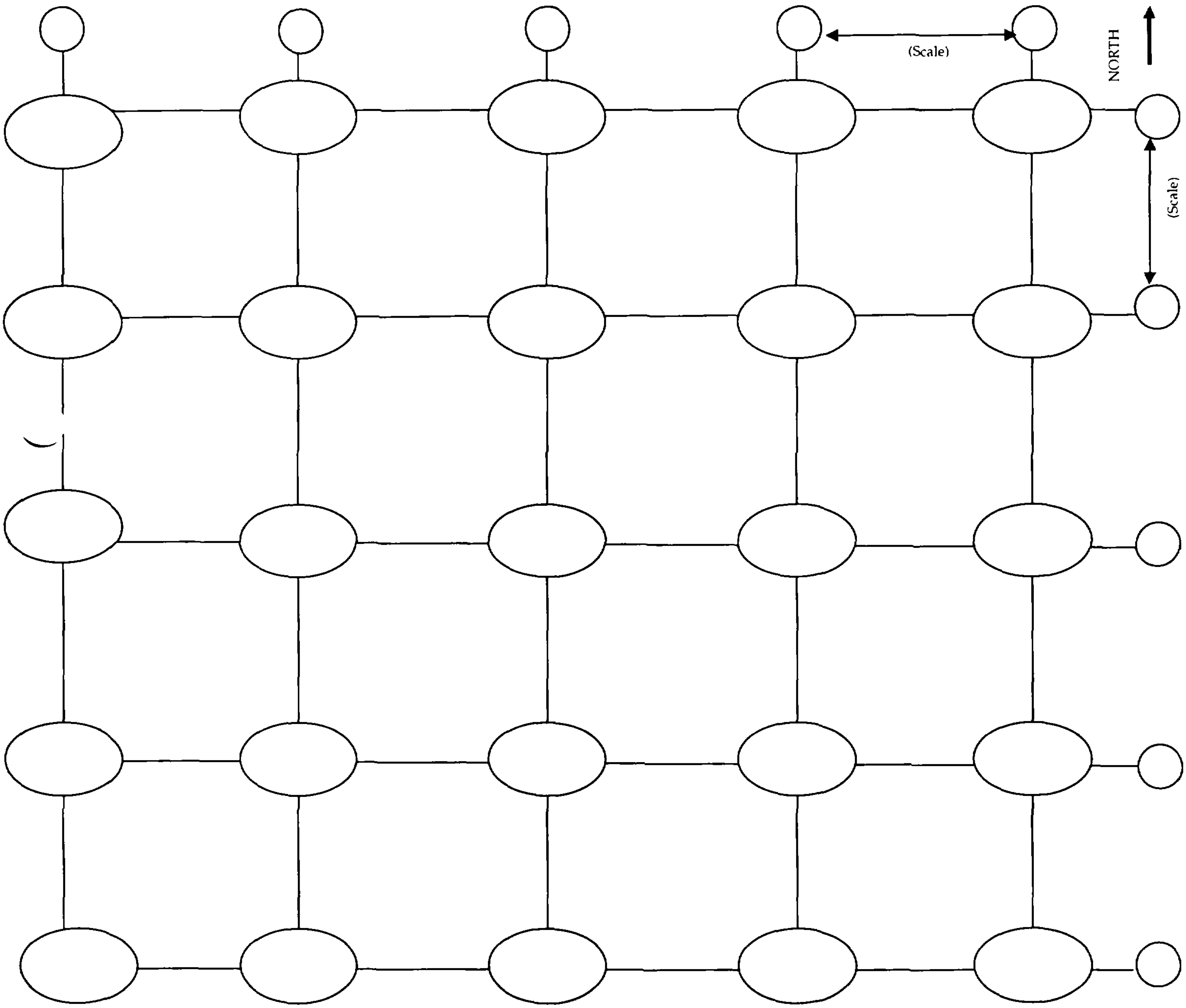
STS Consultants, Ltd.

Date ______________________________ Technician ______________________________

Inst. Model ______________________________ Serial No. ______________________________

Inst. Calibrated (Y/N)? ______________________ Lift Elevation______________________________

Write grid designations in circles. Indicate excavated area with heavy line. Record counts at intersections in CPM. Indicate areas with audible alarms by shading the area.



STS Consultants, Ltd.

RADIATION SURVEY FORM – GRADING

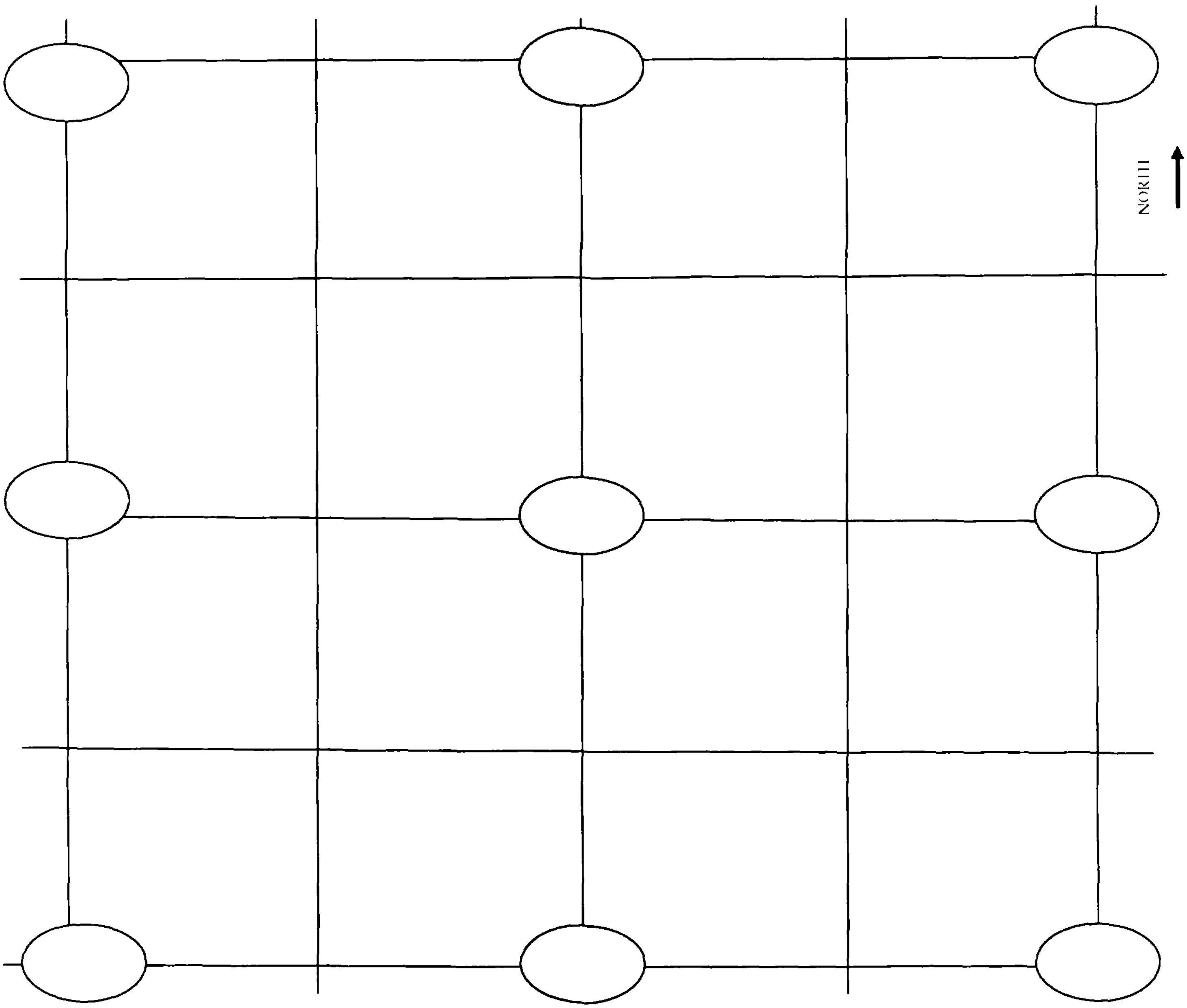
Project # ___________ Project Name _______________ Sheet _____ of _____

Date ______________________________________ Technician ______________________________

Inst. Model ______________________________________ Serial No. ______________________________

Inst. Calibrated (Y/N)? ____________________ Lift Elevation

Write the area coordinates in the large circles. Indicate boundaries of grading/excavation with a heavy line. Survey areas in accordance with Section 5.7 of SOP-210. Within each grid record the maximum cpm. If detected, shade areas of elevated gamma readings (> twice background) and record max cpm.



APPENDIX B

Standard Operating Procedures

SOP-210	Gamma Radiological Surveys
SOP-212	Air Monitoring Procedure
SOP-214	Soil Sampling Procedure
SOP-215	Field Logbook Procedure
SOP-217	Excavation Procedure
SOP-223	Verification Survey
SOP-320	Radioactive Material Shipments
SOP-345	Survey for Surface Contamination and Release of Equipment for Unrestricted Use
SOP-347	Decontamination
SOP-364	Sample Preparation Procedure for Gamma Spectral Analysis
SOP-366	Operation of the ACCUSPEC Gamma Counter
SOP-372	Operation of the Ludlum Model 2000 Alpha System

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Gamma Radiological Surveys

Document: SOP-210

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

GAMMA RADIOLOGICAL SURVEYS

1.0 PURPOSE

This procedure provides protocols for pre-verification or verification gamma radiological surveys.

2.0 SCOPE

Radiological surveys will be performed at the designated Site as part of the pre-excavation, excavation, pre-verification, and/or verification surveying programs.

3.0 REFERENCES

None.

4.0 EQUIPMENT AND MATERIALS

The following equipment may be used as part of the survey programs. Other equipment may be substituted if necessary because of availability of the items listed or the conditions encountered at the site.

- Trimble Pathfinder Pro XL 4.1 GPS (optional).
- 2-inch by 2-inch NaI (Tl) gamma detector.
- Ludlum Model 2221 portable scaler ratemeter analyzer.

5.0 INSTRUCTIONS FOR RADIOLOGICAL SURVEY

5.1 Establishment of Background Gamma Count Rate

5.1.1 The gamma count rate background levels shall be established for each applicable survey instrument. Six randomly selected locations shall be chosen in non-radiologically impacted areas of the Site. A one-minute integrated count shall be obtained at the surface of each location for each survey instrument (Ludlum 2221 with 2" X 2" NaI probe). The measurements collected from each location shall be averaged to establish an instrument specific background gamma count rate.

5.2 Land Survey Procedure

5.2.1 Two perpendicular baselines will be established.

5.2.2 A grid along the baseline will be established using cloth or steel tape and a compass, if necessary. Stakes, survey flags, or paint will be placed as needed to delineate grid or traverse lines. The grids will be spaced about five meters apart.

5.2.3 The baseline, permanent structures, areas of remediation, and other areas of interest will be illustrated in the field logbook.

5.3 Gamma Survey Procedure

5.3.1 The Ludlum ratemeter is set for 2-second time-weighted average count rate.

5.3.2 Hold the survey meter probe parallel to the ground surface at a height of approximately two to six inches.

5.3.3 Walk along grid lines at a maximum speed of about 0.5 meters per second (1 mile per hour).

5.3.4 Continue surveying until all survey grids have been traversed.

5.4 Radiological Survey of On-Site Materials

5.4.1 Material that is excavated and placed in the clean stockpile will be surveyed two times. The first survey will be performed prior to excavation activities.

5.4.2 The second survey will be performed during the excavation of the non-contaminated soil.

The soils will be surveyed before they are placed in the stockpile. Based on the gamma scan, the material will either be designated as contaminated material and immediately loaded for transportation and disposal or tentatively designated as clean and stockpiled for subsequent soil sampling per SOP-214.

5.5. Daily Surveys

5.5.1 Routine daily surveys shall be performed for each day of operations at the site.

5.5.2 The routine surveys will monitor areas in the immediate vicinity of excavations and along soil movement paths to ensure that radiation levels are not affected by activities.

5.5.3 Routine surveys shall be documented by preparing a drawing of the survey results in the field logbook, indicating either the location and value of individual measurements, or contours of the measured gamma field.

5.5.4 Surveys of excavation areas will be made at the request of the Field Team Leader to assess the progress of the removal. These surveys will not be documented, but will be used by the Field Team Leader to manage the excavation.

5.6 Pre-Verification or Verification Survey

5.6.1 Upon completion of excavation activities, either a pre-verification survey shall be performed to ensure that the excavation is ready for a final verification survey by USEPA or a verification survey shall be performed to ensure that the excavation is ready for backfill based on USEPA approval.

5.6.2 The survey is conducted at the same time as the excavation work phase. The survey method is performed as specified in Sections 5.2 and 5.3. Upon completion of the survey and excavation phase, a Notification of Successful Pre-Verification or Verification is sent to the USEPA requesting a final verification survey or approval to backfill.

5.7 Site Grading Survey

5.7.1 Surveys will likely be conducted at the same time as the grading activities and will be performed as specified in Section 5.3 of this SOP.

5.7.2 The corners or boundaries of the area to be surveyed will be tied into a site-wide coordinate/survey network. Stakes, survey flags, or paint will be placed along the boundaries of the survey area using a cloth/steel tape or wheel at approximately 100 foot intervals to subdivide the area into 100 ft X 100 ft areas.

5.7.3 Each 100 X 100 ft areas will be traversed using a line spacing of approximately 10 feet. Readings greater than twice background will be painted and flagged for further investigation.

5.7.4 The maximum gamma count and/or readings over twice background will be recorded on a 50 ft X 50 ft grid on the radiation survey form for site grading (Appendix A). Permanent structures and other issues of interest also will be included on the radiation survey form.

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Air Monitoring Procedure

Document: SOP-212

Revision Number: 1

Date: September 30, 2002 Replaces: June 13, 2002

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Air Monitoring Procedure

Document: SOP-212

Revision Number: 1

Date: September 30, 2002 Replaces: June 13, 2002

AIR MONITORING PROCEDURE

1.0 INTRODUCTION

The Air Monitoring Procedure provides for measuring the concentration of radioactive airborne dust that could be generated and emitted into the atmosphere as a result of the excavation, moving, and loading activities planned at the Site. The objectives of data collection for air monitoring activities are as follows:

- Collect airborne radioactivity data for the purpose of determining the exposure of workers participating in Site activities to airborne particulates
- Collect airborne radioactivity data to measure releases of airborne radioactivity to the environment and ensure that people living and working in the surrounding areas of the Site are not exposed to radiation above acceptable limits
- Collect airborne radioactivity data to evaluate work procedures and Site control measures for the purpose of keeping exposures to both workers and the general public as low as reasonably achievable (ALARA).

2.0 REGULATORY REQUIREMENTS AND ADMINISTRATIVE LIMITS

As specified in 10 CFR Part 20 (unless more restrictive in 32 IAC 340) the licensee must demonstrate compliance with the dose limits for individual members of the public. The Site Air Monitoring Plan is based on being able to demonstrate that the average concentrations of radioactive materials in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the limits specified in Table 2 of Appendix B to 10 CFR 20. The radionuclides in the thorium and uranium series that could potentially be encountered during Site activities are listed in Table 1 of the Air Monitoring Plan. Th-232 has the most restrictive concentrations for both the Derived Air Concentration (DAC) and Air Effluent Limits.

Th-232 Class W DAC=$5\times10^{-13}\mu$Ci/ml Air Effluent=$4\times10^{-15}\mu$Ci/ml

Both worker exposure to airborne particulates and effluent release limits will be based on Th-232.

3.0 AIR MONITORING EQUIPMENT AND MATERIALS

- Staplex Model TFIA High Volume Air Samplers (or equivalent)
- Gilan Model BDXII Low Volume Personal Air Sampler (or equivalent)
- Staplex Model TFA810 "Ashless" Filter Papers – 95% collection efficiency of 1-micron particles. Effective efficiency of 70% (penetration absorption 30%)
- Zefon Model 739 MCE Filter Cartridges – 37mm x 0.8um membrane filters
- Ludlum Model 2200 Scaler w/ Model 43-10 alpha scintillation detector
- Radiological Air Sample Data Form – Area Monitors, Form SOP 212-10
- Radiological Air Sample Data Form – Personal Air Monitors, Form SOP 212-11

4.0 SITE AIR MONITORING PROCEDURE

4.1 Background Air Quality

One downwind, high volume air sample shall be collected for a minimum of forty hours (five 10-hour days) prior to the commencement of excavation activities. This sample shall be analyzed the day after collection and then again after four days to allow for the decay of short lived radon and thoron daughters. The count, after four days decay, will serve as the official measurement of the background airborne alpha concentration. Future results during Site operations should be compared to this value to see if further engineering controls or procedural changes are warranted.

4.2 Perimeter Air Monitoring – High Volume Samplers

Four air monitoring locations shall be used during all excavation activities. These monitoring units will be at the property boundary or no more than 200 feet from the limits of the areas anticipated to be excavated. Samples shall be collected during all operations where potentially contaminated soils are being excavated, moved, or loaded. One monitor shall be placed on each perimeter of the site (North, South, East, and West) and collect samples at a height between one and two meters above the ground. Monitors will be located so as to provide unobstructed air flow from the source to the monitors. Flow rate through air samplers shall remain between 20 and 60 cubic feet per minute. Air sample filters shall be collected and replaced daily and submitted to the laboratory for analysis. Samples analyzed from the perimeter high volume monitors shall be used to determine the amount of airborne radionuclides leaving the Site.

4.3 Personal Air Monitoring – Lapel Samplers (Low Volume)

All workers participating in Site activities that involve the excavation, movement, or loading of potentially contaminated soils within a radiological exclusion zone shall wear a Personal Air Monitor (PAM) to evaluate the air quality in the worker's breathing zone. The Health and Safety Coordinator may require that additional personnel wear PAMs if there is a potential for that worker to encounter airborne particulates during Site operations. Samples shall be collected the entire time a worker is inside the exclusion zone and the cumulative time recorded. Flow rate through air samples shall remain between 2 and 4 liters per minute. Air sample filters shall be collected and replaced daily and submitted to the laboratory for analysis. Samples analyzed from the PAMs shall be used to determine potential contributions to worker's dose from airborne radionuclides.

5.0 AIR SAMPLE ANALYSIS

The Th-232 decay series contains seven alpha-emitting nuclides: Th-232, Th-228, Ra-224, Rn-220, Po-216, Bi-212 and Po-212. Of these, the first three nuclides can be assumed to be in complete equilibrium. The noble gas Rn-220 (thoron) may be ejected from the original matrix by recoil from the alpha particle decay of Ra-224. The fraction of Rn-220 that is removed via emanation is dependent on several variables, and is assumed to range from 10% to 40%. The emanating fraction is assumed to be transported away from the original matrix. If 40% of the Rn-220 escapes, the activity of the Rn-220 and its three alpha-emitting progeny nuclides will be at 60% of the Rh-232 activity. These four alpha-emitting nuclides produce a total of 3.35 alpha emissions per Rn-220 decay. Since the Rn-220 activity is 60% of the Th-232 activity, these four nuclides only emit the equivalent of two alpha particles per Th-232 decay. These two alphas when combined with the three alpha particles from the nuclides in full equilibrium with the parent, result in the total emission of the five alpha particles. Thus, the Th-232 contribution will be one-fifth or 20% of the total alpha activity.

For the reasons stated above, gross alpha concentrations shall be divided by a factor of five to determine the air concentration of Th-232, which is the most limiting of the applicable air effluent concentration limits (4×10^{-15} μCi/ml).

5.1 High Volume Sample Analysis

A 1.75 inch diameter cutout shall be obtained from each 8"x10" high volume sample collected. All data pertaining to the sample shall be included on the *Radiological Air Sample Data Form – Area Monitors* worksheet. This worksheet contains the calculations required to determine total sample volume and sample concentration.

Each sample shall be analyzed the day after collection for gross alpha concentration. The minimum counting time is 30 minutes for Th-Alpha. The "day after" count will serve as a comparison to identify high gross counts from the previous day. It is expected that naturally occurring radon and thorium daughters will interfere with analysis, so the sample must be reanalyzed in four days. Thoron (Rn-220), if present in significant amounts, will require up to four days to allow for the decay of its Pb-212 daughter (10.6 hour half life). The count, after four days decay, will serve to be the official measurement of Th-Alpha.

Th-232 is the most restrictive of the applicable radionuclides that may be present during Site operations. The Th-232 contribution will account for 20% of the total alpha activity, so each gross alpha count must be divided by five to determine Th-232 concentration.

Multiple concentration measurements improve both precision and detection capability. Although air samples shall be counted the following day (and again four days later), effluent releases shall be reported on a weekly basis using the following calculation:

Equation A.9 NUREG 1400

$$C_{avg} = \frac{\Sigma\, T_{s,i}\, C_i}{\Sigma\, T_s}$$

where C = effluent concentration in μCi/ml
T_s= duration of sample collection

Sample concentration shall be determined using the following calculation:

Equation 6.9 *NUREG 1400*

$$C = \frac{R_n}{E\ F\ K\ T_s\, cf\ (5)}$$

Where:

R_n = net count rate; $R_n = R_g - R_b = \frac{N_g}{T_g} - \frac{N_b}{T_b}$
E = fractional filter efficiency
F = air flow rate through the air sampler, cm^3/min
Cubic feet per hour x 28.316 liters/cfh x 1000 ml/ liter
K = Counting efficiency in cpm/ μCi
T_s = duration of sample collection
Cf = collection vs. analyzed ratio: conversion factor = 0.035

** note: cf is not part of original NUREG calculation. It has been added to account for the fact that we are only analyzing 3.5% of total sample

5 = Samples are analyzed for gross alpha activity. Gross alpha concentration is to be divided by five to determine Th-232 concentration

5.2 Personal Air Monitor Sample Analysis

Personal Air Monitor (PAM) samples shall be analyzed in the same manner as the high volume perimeters samples. The only exceptions are that samples may be collected over the course of one week and that calculations are performed on a different worksheet – *Radiological Air Sample Data Form – PAM's, Form SOP 212-11.*

The action level for airborne radioactivity shall be 30% of the Derived Air Concentration (DAC) for Th-232 (DAC=5×10^{-13} μCi/ml). When PAM analysis indicates that concentrations have reached 1.5×10^{-13} μCi/ml, Level C protection may be considered. It is not anticipated that airborne concentrations will reach this level. Engineering controls, such as wetting of soils, and procedural changes shall be implemented to keep airborne concentrations ALARA.

At the conclusion of the project, data obtained from PAM's shall be used to determine a dose from airborne radionuclides for each monitored worker.

6.0 INVESTIGATIONS AND CORRECTIVE ACTIONS

The Health and Safety Coordinator will perform investigations and responses consisting of one or more of the following actions in the event that Action Levels are exceeded:

- Verification of laboratory data and calculations.
- Analyze and review probable causes.
- Evaluate need for reanalysis or additional analysis on original sample.
- Evaluate need for resampling.
- Evaluate need for sampling of other pathways.
- Evaluate need for notifications to regulators
- Dose assessments/bioassays.

7.0 ATTACHMENTS

- Table 1 *Derived Air Concentrations (DACs) and Effluent Air Concentrations of Selected Radionuclides in the Uranium and Thorium Series*
- Minimum Detectable Concentration Calculation – Area Monitors
- Minimum Detectable Concentration Calculation – PAM's
- Radiological Air Sample Data Form – Area Monitors, Form SOP 212-10
- Radiological Air Sample Data Form – PAM's, Form SOP 212-11

TABLE 1

Derived Air Concentrations (DACs) and Effluent Air Concentrations of Selected Radionuclides in the Uranium and Thorium Series

Radionuclide	Class	10 CFR 20	
		DAC (μCi/ml)	Air Effluent (μCi/ml)
^{238}U	D	$6x10^{-10}$	$30x10^{-12}$
	w	$3x10^{-10}$	$1x10^{-12}$
	Y	$2x10^{-11}$	$6x10^{-14}$
^{234}Th	w	$8x10^{-8}$	$3x10^{-10}$
	Y	$6x10^{-8}$	$2x10^{-10}$
^{234}U	D	$5x10^{-10}$	$3x10^{-12}$
	w	$3x10^{-10}$	$1x10^{-12}$
	Y	$2x10^{-11}$	$5x10^{-14}$
^{230}Th	w	$3x10^{-12}$	$2x10^{-14}$
	Y	$6x10^{-12}$	$3x10^{-14}$
^{226}Ra	w	3x10-10	$9x10^{-13}$
$_{222}$Rn	With Daughters Removed	$4x10^{-6}$	$1x10^{-8}$
	With Daughters Present	$3x10^{-8}$	$1x10^{-10}$
		or 0.33 of working level	
^{214}Pb	D	$3x10^{-7}$	$1x10^{-9}$
^{214}Bi	D	$3x10^{-7}$	$1x10^{-9}$
	w	$4x10^{-7}$	$1x10^{-9}$
^{210}Pb	D	$1x10^{-10}$	---
^{232}Th	w	$5x10^{-13}$	$4x10^{-15}$
	Y	$1x10^{-12}$	$6x10^{-15}$
^{228}Ra	w	$5x10^{-10}$	$2x10^{-12}$
^{228}Th	w	$4x10^{-12}$	$3x10^{-14}$
	Y	$7x10^{-12}$	$2x10^{-14}$
^{220}Rn	With Daughters Removed	$7x10^{-6}$	$2x10^{-8}$
	With Daughters Present	$9x10^{-9}$	$3x10^{-11}$
		or 1.0 working level	
^{212}Pb	D	$2x10^{-8}$	$5x10^{-11}$
^{212}Bi	D	$1x10^{-7}$	$3x10^{-10}$
	w	$1x10^{-7}$	$4x10^{-10}$
^{228}Ac	D	$4x10^{-9}$	$2x10^{-11}$
	w	$2x10^{-8}$	$8x10^{-11}$
	Y	$2x10^{-8}$	$6x10^{-11}$
^{234m}Pa	w	$3x10^{-6}$	$1X10^{-8}$
	Y	$3x10^{-6}$	$9x10^{-9}$
^{235}U	D	$6x10^{-10}$	$3x10^{-12}$
	w	$3x10^{-10}$	$1x10^{-12}$
	Y	$2x10^{-11}$	$6x10^{-14}$
^{231}Pa	w	$6x10^{-13}$	$6x10^{-15}$
	Y	$2x10^{-12}$	$8x10^{-15}$
^{227}Ac	D	$2x10^{-13}$	$1x10^{-15}$
	w	$7x10^{-13}$	$4x10^{-15}$
	Y	$2x10^{-12}$	$6x10^{-15}$
^{227}Th	Y	$1x10^{-10}$	$5x10^{-13}$
	w	$1x10^{-10}$	$5x10^{-13}$

FORM SOP 212-10

RADIOLOGICAL AIR SAMPLE DATA FORM – AREA MONITORS

Equation:

Volume (V) = (Pump ml/min.) (Total Sample Time) (count/sample conversion)
Multiply Cubic Feet by 28.316 to Obtain Liters
Ml/min = (L/min.) (1000 ml/L)

SAMPLE COLLECTION

Sample #	Per. By	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic Ft/min. (CFM)	Count vs. Sampled Conv.	Total Sample Volume (ml)

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{\text{(Net CPM) (1/Eff.)}}{\text{(V) (2.2 E + 6 dpm/uCi) (filter retention factor) (5)}}$$

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A)μCi/ml	Background Activity (B)μCi/ml	Actual Concentration μCi/ml
4 day recount									

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

Note: Activity is divided 5 due to the Thorium daughters that are counted with an open window (gross alpha)

Conversion factor for volume analyzed vs. volume sampled for 1.75" diameter cut-out = 0.035

30 minute background count for ____________ (date) is ______________ cpm

30 minute background count for ____________ (date) is ______________ cpm

FORM SOP-212-11

RADIOLOGICAL AIR SAMPLE DATA FORM – PAM'S

Equation:

Volume (V) = (Pump liters/min.) (Total Sample Time in minutes) (1000 ml/liter)

Sample Collection

Person Wearing Monitor	Pump #	Sample #	Date	Sample Start Time	Sample End Time	Total Sample Time	Cubic liters/min. LPM	Total Sample Volume (ml)

Equation: Actual Activity = Activity (A) - Background (B)

$$\text{Activity (A)} = \frac{\text{(Net CPM) (1/Eff.)}}{\text{(V) (2.2 E + 6 dpm/uCi) (filter retention factor) (5)}}$$

Sample Analysis

Sample #	Cal. By	Date	Gross Counts	Net CPM	Detector Efficiency (EFF)	Sample Volume Analyzed (ml)	Sample Concentration (A)μCi/ml	Background Activity (B)μCi/ml	Actual Concentration μCi/ml

Filter retention factor/absorption correction = 0.7 for Staplex 8x10 ashless paper filter
= 1.0 for 37mm PAM membrane filters

Note: Activity is divided 5 due to the Thorium daughters that are counted with an open window (gross alpha)

30 minute background count for ____________ is ______________ cpm
date

30 minute background count for ____________ is ______________ cpm
date

MINIMUM DETECTABLE CONCENTRATION CALCULATION – PAMS

Sensidyne Personal Air Monitor Samples analyzed on Ludlum 43-10 Alpha Counter

$$MDC = \frac{2.71}{n\,E\,F\,K\,T_g\,T_g} \qquad \frac{3.29\sqrt{Rb}\left[\frac{1}{Tb}+\frac{1}{Tb}\right]}{n^{1/2}\,E\,F\,K\,T_s}$$

n = number of sampling intervals
E = fractional filter efficiency
F = airlow rate through the sampler in cm^3/min
K = counting efficiency in cpm/μCi
T_s = duration of sample collection in min
T_g = gross counting time
T_b = background counting time
R_n = net count rate in cpm
R_b = background count rate in cpm
C = concentration of radioactive material in the air in μCi/cm^3

N = 5 days of sampling minimum per week
E = 1.0 37mm 0.8 μm MCE Filters
F = 2.5×10^3 cm^3/min (or ml/min)
2.5 liters per minute x 1000 ml/l = 2500 ml/min
K = 699300
0 315 count/disintegration x 2.22 x 106 dis/μCi = 699300 cpm/μCi
T_s = 480 min
Based on a minimum of 8 hours per day
T_g = 30 min
T_b = 600 min

Rb = 0.58 cpm, based on 3000 min background count on 9/16 – 9/20/02

$$MDC = \frac{2.71}{(5)\,(1.0)\,(2500)\,(699300)\,(480)\,(30)} + 3.29\;\frac{\sqrt{(0.58)}\left[\frac{1}{(600)}+\right]\frac{1}{(30)}}{(2.24)\,(1.0)\,(2500)\,(699300)\,(480)\,(30)}$$

= 2.98×10^{-14} μCi/ml (gross alpha weekly MDC)
= 5.96×10^{-15} μCi/ml (gross alpha ÷ 5, for Th-232)

MINIMUM DETECTABLE CONCENTRATION CALCULATION

Sensidyne TFIA High Volume Air Samples analyzed on Ludlum 43-10 Alpha Counter

$$\text{MDC} = \frac{2.71}{n\,E\,F\,K\,T_g\,T_g} \qquad \frac{3.29\sqrt{Rb}\left[\frac{1}{Tb}+\frac{1}{Tb}\right]}{n^{1/2}\,E\,F\,K\,T_s\,cf}$$

NUREG 1400 Air Sampling in the Workplace Appendix A (eq A.17)

- n = number of sampling intervals
- E = fractional filter efficiency
- F = airlow rate through the sampler in cm^3/min
- K = counting efficiency in cpm/μCi
- T_s = duration of sample collection in min
- T_g = gross counting time
- T_b = background counting time
- R_n = net count rate in cpm
- R_b = background count rate in cpm
- Cf = count vs. sample conversion
  (this is not part of NUREG 1400, however, analysis volume must be taken into account)

- n = 5 days of sampling minimum per week
- E = 0.7 (referred to as filter retention factor on air sampling form)
- F = 1.13×10^6 cm^3/min (or ml/min)
  40 ft^3/min x 28.316 liters/ft^3 x 1000 ml/l = 1.13×10^6 ml/min
- K = 699300
  0.315 count/disintegration x 2.22 x 106 dis/μCi = 699300 cpm/μCi
- T_s = 480 min
  Based on a minimum of 8 hours per day
- T_g = 30 min
- T_b = 600 min
- Cf = 0.035
  8" x 10" original filter size = 80 $inches^2$
  0.3 inch border is covered by sampler plate and not sampled = 10.8 $inches^2$
  filter cutout = $\pi r^2 = (0.875")^2 (3.14) = 2.41$ $inches^2$
  actual sample area = 80 $inches^2$ – 10.8 $inches^2$ = 69.2 $inches^2$
  sample analyzed vs. sample collected ration = 2.41/69.2 = 0.035
- r_b = 0.58 cpm, based on 3000 min background count on 9/16 – 9/20/02

$$\text{MDC} = \frac{2.71}{(5)\,(0.7)\,(1.13E6)\,(699300)\,(0.035)\,(480)\,(30)} + \frac{3.29\sqrt{(0.58)}\left[\frac{1}{(600)}+\right]\frac{1}{(30)}}{(2.24)\,(0.7)\,(1.13E6)\,(699300)\,(0.035)(480)\,(30)}$$

= 2.69×10^{-15} μCi/ml (gross alpha weekly MDC)
= 5.39×10^{-16} μCi/ml (gross alpha + 5, for Th-232)

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Soil Sampling Procedure

Document: SOP-214

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

SOIL SAMPLING PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to present protocol for collecting soil samples for the Site.

2.0 SCOPE

This procedure applies to samples collected for radiological or geotechnical analysis. Soil samples may be collected of potential backfill soils or other soils. The Field Team Leader will coordinate the sampling efforts.

3.0 REFERENCES

U.S. Nuclear Regulatory Commission, NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, June 1992.

4.0 EQUIPMENT AND MATERIALS

4.1 Equipment and Materials Management

Downhole tools and samplers are cleaned in accordance with the Decontamination Procedure (SOP-347).

Cuttings, fluids, samples, and water are placed in 55-gallons drums, labeled, properly stored on-site, and disposed of in a manner that does not violate local, state or federal rules or regulations and in a manner that does not damage public or private property.

4.2 Sampling Equipment and Materials

Equipment used for soil sampling includes the following:

- Auger or other Coring Tool
- Shovel and Trowel
- Plastic Collection Bags
- Plastic Sheets (optional)
- Sampling Tracking Form (Form SOP-214-1)
- Field Logbook (SOP-215)
- Field Sample Screening Form (Form SOP-214-2 or holding samples)
- Pin Flags (for marking sample locations)
- Container (for collecting potentially contaminated waste generated during the sampling process) (e.g., gloves, plastic sheets, etc.)
- Bucket (filled with clean rinse water)
- Bucket (for homogenizing samples)
- Stainless Steel Brush
- Moist Towelettes
- Paper Towels
- Latex Gloves
- Survey Instrument (for verifying clean sampling equipment and hands).

Other equipment may be substituted, if necessary, because of availability of the items listed or the conditions encountered at the site. Substitute equipment shall be documented in the Field Logbook and approved by the Field Team Leader.

5.0 SAMPLING PLAN

Selection of the sampling plan to characterize a soil is a function of the goals of the investigation, the variability of the parameters being measured, and the impact of the variability on the conclusions. Samples may be collected randomly or they may be collected from specific areas deliberately chosen to represent the range of conditions expected or unusual conditions of particular interest. In general, randomly chosen samples are appropriate to assess overall site conditions. However, there may be instances where the significance of an observed condition is of interest. The choice of method will, therefore, depend on the specific goals of the sampling activity.

The procedure presents sampling methods based on random sampling. For the reasons stated above, variations to the methods provided in this procedure may be requested by the Field Team Leader. Such variations shall be documented in the Field Logbook by field personnel.

6.0 ON-SITE STOCKPILE SOIL SAMPLING

The following are the steps to be followed for on-site stockpile soil sampling.

6.1. Excavated soil may be stockpiled. Samples from the stockpiles may be analyzed.

6.2. The soil may be stockpiled in piles varying from a few to several thousand cubic yards. Because of this potential variation in pile size, no single method for sampling or type of equipment can be prescribed that will work for every situation. The two basic methods that can be used for sampling stockpiles, core sampling method and lift sampling method, are described in paragraphs 7.3 and 7.4, respectively. Both methods are based on the premise that in order for a sample to be representative of the pile, every particle in the pile must have an equal probability of being included in the sample.

6.3 One of the methods, the core sampling method, assumes that the pile can be completely penetrated using a coring tool (i.e., sampling probe or drill rig). On conical shaped piles, the sample is to be taken approximately perpendicular to the surface of the pile, midway between the peak and the base, to the center of the pile. On piles with flattened tops, the sample is to be taken perpendicular to the surface from the top to the bottom of the pile.

6.4 The other stockpile sampling method, the lift sampling method, assumes that the pile can not be completely penetrated with a sampling tool, and therefore must be sampled either as the soil is placed in lifts onto the pile or before the soil is removed in lifts for use. The samples will, therefore, only be representative of the discrete layer of soil that is exposed to the sampling.

6.5. With either sampling method, to identify the areas to be sampled, the pile shall always be faced looking north. For flat topped piles, divide the stockpile into an imaginary grid with square or rectangular shaped sections approximately equal in area; the grids on flat topped piles should be numbered from left to right, top to bottom. For conical shaped piles, divide the stockpile into an imaginary grid with pie shaped sections of equal areas; the grids on conical shaped piles should be numbered in clockwise pattern.

6.6. Determine the initial number of grids and samples as follows:

Pile Size (cubic yards)	Number of Grids	Number of Lift Samples[1]	Number of Core Samples[2]
< 50	3	3	3
50 to 100	5	5	5
101 to 500 .	6	5	6
500 to 1,000	7	5	7
1,000 to 2,000	8	6	8

Pile Size (cubic yards)	Number of Grids	Number of Lift Samples[1]	Number of Core Samples[2]
2,000 to 4,000	9	6	9
4,000 to 6,000	10	7	10
6,000 to 8,000	11	7	11
8,000 to 10,000	13	8	13
10,000 to 20,000	16	8	16
20,000 to 40,000	20	10	20
40,000 to 70,000	30	15	30
70,000 to 100,000	36	15	36
100,000 to ---[3]	36+	15+	36+

Notes:

1 Take one sample from each grid randomly chosen. In order to choose the grids to be sampled randomly, use some blank sample identification tags and number the tags from one (1) to (n), where (n) represents the number of grids in each pile. Put the tags into a sample bag, shake the bag and reach in and blindly select a tag. Continue selecting tags until the required number of grids are selected. The numbers will be chosen without replacement, that is, without returning the used number to the bag. The samples shall be taken from the grids that correspond to the randomly chosen numbers. An alternative method would be to use a computer generated random numbering system available in various spreadsheet programs (i.e., Excel).

2 From the randomly chosen grids, take one composite sample for approximately every ten (10) feet of soil depth to obtain the required number of samples. For example: if a 98 cubic yard pile is 10 feet high, according to the above table, five (5) composite samples are required (i.e., one for each grid). If an 11,000 cubic yard pile is 30 feet deep, three composite samples, one composite sample at each ten feet of depth, will be taken from 5 of the grids and one composite sample will be taken from a sixth, randomly chosen grid.

3 Add one sample for each additional 10,000 cubic yards.

6.7 Take the sample and submit it to the laboratory for analysis.

6.8. Statistically test the results of the sample analyses to determine how much uniformity the samples show and whether more samples must be taken.

6.9. If necessary, take additional samples and analyze. Continue to repeat steps 6.7 arid 6.8 until there are enough samples to characterize the pile.

6.10. As directed by the Field Team Leader, identify materials suitable for backfill or other purpose for which the sampling was done.

6.11. To compare the sample data with the desired criteria, calculate the average (X bar of all the samples) in the pile using:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} xi$$

6.12 If the average satisfies the desired criteria, the results can be further evaluated to determine whether the data provide a 95 percent confidence level that the true mean (μ) meets the relevant criteria. The Field Team Leader will consult with the Project Coordinator to determine if this further evaluation is required.

7.0 IN-SITU SOIL SAMPLING

This section describes the methods for choosing sample locations and sampling methods.

7.1 Sample Location Selection

Appropriate in-situ soil sample locations are determined by the size and uniformity of the deposit being sampled. The sampling pattern depends upon the size of the area, the uniformity of the soil stratum being sampled, and the volume of soil that is being sampled.

Sampling plans for particular purposes may specify a pre-established sampling frequency in terms of the maximum volume of soil represented by a sample. If the soil being sampled is statistically homogeneous, then the locations for samples can be selected randomly over the area and thickness of the deposit. If the soil is not statistically homogeneous, then the area must be broken into sub-areas within which the soils are statistically homogeneous, and each area sampled separately. The issue of statistical homogeneity is resolved by comparing the range of variation of the property being judged to the acceptability criteria. For example, a deposit of sand and gravel may be statistically homogeneous when judged against a standard that the material not contain boulders and not be homogeneous when judged against a standard that no gravels be larger than one inch.

Clearly, also, the number of samples required to resolve the second comparison may be larger than the number required to resolve the first. The sampling frequencies given in the Sections 10.3 and 10.4 (Stockpile Sampling) may be used as a guide in estimating an initial number of samples, but the actual number required for a particular purpose depends very strongly upon the requirements and materials being sampled.

7.2 Drilling Procedures

No drilling is planned.

8.0 OPERATIONAL SUPPORT SAMPLING

Sampling may be required to support the excavation and restoration action. This sampling may be performed in instances when the Field Team Leader is interested in the significance of an observed variation or when looking for cursory information to provide operational guidance. The choice of the method will, therefore, depend on the specific goals of the sampling activity as determined by the Field Team Leader. This sampling is not a quality activity, and may be performed outside the requirements of this procedure. However, all deviations requested by the Field Team Leader must be documented in the Field Logbook by field personnel.

The sampling technique for surface sampling, subsurface sampling, and stockpile sampling, as described in this procedure, shall be used when sampling in these instances.

9.0 SAMPLE TRACKING

To establish the documentation necessary to track the sample from the time of collection, the sample identification and Sample Tracking Forms must accompany samples that are sent to the laboratory.

All potentially contaminated samples to be submitted to the laboratory will be screened for radiation in the field. Information obtained from this survey will be documented on the Sample Tracking Form (Form SOP 214-1). Samples taken from potential borrow areas generally are not screened.

10.0 SAMPLING METHODS

10.1 Surface Soil Sampling

10.1.1. If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled; assemble the sampling equipment required.

10.1.2. Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant
- Collected by (your name)

10.1.3. Mark the collection bag or prepare the identification tag for the sample.

10.1.4 Collect the soil samples that are representative of the soil in the area surveyed. Use a shovel or trowel to collect soil from the depth required.

10.1.5 Remove rocks, sticks, and foreign objects greater than approximately one-quarter (1/4) inch.

Stir and homogenize the soil in a bucket as much as practicable. Using the hand trowel, randomly scoop the soil from the bucket. Save alternating scoops of material to collect the required sample size; return the other material to the sampling locations.

10.1.6 Attach the identification tag to the sample bag if appropriate and place the bag in the sample container.

10.1.7 Decontaminate the sampling equipment as required by Section 11.

10.1.8 Return any location markers (such as pin flags) that, were removed in order to sample. Fill in all sampling holes to eliminate a possible tripping hazard.

10.1.9 If specific data are not available, mark a pin flag with the sample identification number and place the flag at the center of the sampling location before leaving.

10.2 Subsurface Sampling (Undisturbed Soils)

10.2.1 If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled; assemble the sampling equipment required.

10.2.2 Enter the complete information on the Sample Tracking Form

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant
- Collected by (your name)

10.2.3 Mark the collection bag or prepare the identification tag for the sample.

10.2.4 Sample the material using a hand core sampling tool or hammer driven split spoon sampler.

Alternatively, an auger method may be used.

Cut a hole, approximately six (6) inches in diameter, in the center of a plastic sheet. Center the sheet of plastic over the area to be sampled. Using an auger, drill through the hole in the plastic to the desired sampling depth; keep the auger turning until no more material comes up. The soil around the hole, on the plastic sheet, is fairly well mixed and representative of the interval just drilled.

If the soil sample is to be obtained from a particular depth (not a composite from surface to depth), and the material refuses to pass into the coring tool, the following sampling method will be performed. Drill through the hole in the plastic to the top of the desired sampling depth; keep the auger turning until no more material comes up. Remove the auger and sample the material using a hand core sampling tool or hammer driven spilt spoon sampler. The first three inches of the sampled obtained will be considered slough and not part of the desired sample.

NOTE: If, due to the conditions of the sampling area, this method does not work, an alternative method(s), approved by the Field Team Leader, may be used. Alternative methods, when used, will be documented by the field personnel in the Field Logbook.

10.2.5 Remove rocks, sticks, and foreign objects greater than approximately one (1) inch in diameter.

NOTE: The removed rocks will be collected and submitted as a separate sample.

10.2.6 Using a hand trowel, collect approximately one (1) quart of the augured soil in the plastic sample bag or jar. For core segments, place each 6-9 inch (nominally 5-7 inch) segment in the plastic sample bag or jar.

10.2.7 Label the sample container.

10.2.8 Return unused material to the sampling hole and fill in the hole to eliminate possible tripping hazard.

10.2.9 Decontaminate the sampling equipment as required by Section 11.

10.2.10 When required, mark a pin flag with the sample identification number and place the flag at the center of the sampling location before leaving.

10.3 Stockpile Sampling (Core Sampling Method)

10.3.1 If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled and assemble the sampling equipment required.

10.3.2 Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant. Identify the approximate size of the stockpile. (A 70 cubic yard pile of soil is approximately ten feet high with a base diameter of approximately 26 feet.) Include a brief description of the equipment used to obtain the sample (i.e., sub-soil sampler, drill rig, etc.).

- Collected by (your name)

10.3.3 Before sampling, determine the number of grids and samples as described in Section 6.6. Record the information in the Field Logbook.

10.3.4 Mark the collection bag or prepare the identification tags for the samples.

10.3.5 Using an auger or other coring tool, take the required number of samples from the pile. A hollow stem auger will be used when discrete, rather than composite, samples are collected.

10.3.6 Place the sample material in the sample bag and attach the identification tags. Place the sample bag in the container.

10.3.7 Decontaminate the sampling equipment as required by Section 11.

10.4 Stockpile Sampling (Lift Sampling Method)

10.4.1 If necessary, to minimize contamination, spread a clean sheet of plastic next to the area to be sampled and assemble the sampling equipment required.

10.4.2 Enter the complete information on the Sample Tracking Form:

- Sample Number
- Sample Matrix
- Sample Location
- Purpose of Sample Collection
- Include applicable comments regarding the sample, location, weather, conditions, or other factors that may be relevant. Identify the approximate size of the stockpile. (A 70 cubic yard pile of soil is approximately ten feet high with a base diameter of approximately 26 feet.) Include a brief description of the equipment used to obtain the sample (i.e., sub-soil sampler, drill rig, etc.).
- Collected by (your name)

10.4.3 Before sampling, determine the number of grids and samples as described in Section 6.6. Record the information in the Field Logbook.

10.4.4 Mark the collection bag or prepare the identification tags for the samples.

10.4.5 Using the appropriate sampling tool, take the required number of samples from the lift approximately perpendicular to the surface of the lift at the appropriate locations. Composite the sample through the entire lift thickness.

10.4.6 Place the sample material in the sample bag and attach the identification tags. Place the sample bag in the container.

10.4.7 Decontaminate the sampling equipment as required by Section 11.

10.5 Soil Sample Size

10.5.1 Each soil sample will be a minimum of four (4) pounds and the sample may exceed ten (10) pounds. Sample size requirements are detailed in Sample Preparation Procedure for Gamma Spectral Analysis (SOP-364).

11.0 EQUIPMENT CLEANING

To avoid cross-contamination, the sampling equipment will be cleaned prior to and between samples. The following steps will be followed to clean equipment.

- Remove loose contamination by gently tapping/shaking the item.
- Using the stainless steel brush or paper towels, remove material that did not dislodge.
- If the item appears to be clean (i.e., no visible clinging soil), proceed to the next sampling area.
- If the item does not appear to be clean or if a survey with the appropriate instrument does not verify that it is, scrub the item with water. While holding the item over the sampling location, rinse the item with water.
- Dry the item with paper towels or repeat the scrubbing sequence as necessary.
- Rinse gloved hands. Change gloves when changing sampling areas if a self-frisking indicates that contamination is present after rinsing.
- Approximately one percent of the time, swipe the item as described in the Gamma Radiological Survey SOP (SOP-210). Submit the swipes to the laboratory for analysis to confirm the effectiveness of the decontamination protocol. (This step is necessary only when sampling soils where radiologic contamination is suspected.)
- Dispose of cleaning materials, plastic sheeting, and gloves as contaminated materials in accordance with instructions provided by the Field Team Leader.

12.0 QUALITY CONTROL

12.1 Quality Control Samples

To evaluate the variance in the soil sampling protocol, field duplicates will be collected at specified intervals. These quality control (QC) samples will be identified and noted in the Field Logbook.

To validate the sampling protocol used for surface sampling, initially one (1) area on every twenty (20) sub-grids sampled.

For surface sampling, the duplicates shall be randomly selected and identified before sampling activities begin. The duplicate sample material will be collected using the next scoop full of material each time the initial sample is saved.

For subsurface samples, one duplicate subsurface sample will be taken for every twenty (20) samples.

For subsurface sampling, the duplicate will be collected from the representative augered material.

For stockpiles, one duplicate will be taken for every twenty (20) stockpile samples, or one each day that stockpile sampling takes place, whichever is greater.

The stockpile duplicate will be taken from the node of two grids. The duplicates will be randomly selected and identified before the sampling begins.

The Field Team Leader will calculate the mean and the standard deviation for the samples analyzed. If the duplicate sample results are within three (3) standard deviations of the sample population, the sampling protocols can be considered acceptable.

If the Project Coordinator approves, the Field Team Leader can reduce the frequency of the QC duplicate sampling based on the results obtained. Changes shall be documented in the Field Logbook.

12.2 Data Review

Entries in the Field Logbook will conform to the Field Logbook Standard Operating Procedures.

Daily, the Field Team Leader will review the Field Logbook, resolve any discrepancies that were noted by field personnel, and sign the book to indicate the pages reviewed. If the Field Team Leader recorded the discrepancy, the Quality Assurance Supervisor will review the Field Logbook and resolve any discrepancies that were noted.

NOTE: Discrepancies relating to reported data will be brought to the attention of the Field Team Leader.

13.0 HEALTH AND SAFETY

Personal protective equipment and clothing, as required by the Health and Safety Plan, will be used when collecting and handling contaminated soils.

The site radiological conditions will be determined and documented before sampling begins. During the sampling process, the principles of As Low As Reasonably Achievable (ALARA) will be followed.

14.0 RECORDS

The following documents will be maintained as quality records:

- Field Logbooks
- Sampling Tracking Forms
- Results of all Calculations and Statistical Analyses Performed

FORM SOP-214-1

SAMPLE TRACKING FORM

Date: ______________________ Page ______ of ______

Sample Number	Matrix (S/W)	Location	Collected For	Comments	Collected By
Released by/company			All samples listed above are hereby released except for:		Date/Time
Received by/Company			All samples listed are hereby received except for:		Date/Time
Received by/Company			Data for all samples listed above are hereby received except for:		Date/Time

FORM SOP-214-2

FIELD SAMPLE SCREENING FORM

Sample Type:	Sample ID Number:
Date:	Time:
Counting Instrument:	Sample Date:
Reading Units:	
Signature of Technician:	Date:
Signature of Reviewer:	Date:

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Field Logbook Procedure

Document: SOP-215

Revision Number: 0

Date: June 19, 2002 Replaces: New

FIELD LOGBOOK PROCEDURE

1.0 PURPOSE

This procedure describes standard protocol for the use and control of the Field Logbooks used during the Site remediation.

2.0 SCOPE

This procedure applies to field activities that are associated with the Site cleanup.

3.0 REFERENCES

STS Consultants, Ltd. Quality Assurance Manual

4.0 EQUIPMENT AND MATERIALS

Field Logbook.

Indelible pen or pencil.

5.0 INSTRUCTIONS

5.1 Field Logbook Format

5.1.1 Prior to entering the field, page numbers shall be assigned to the pages of the Field Logbook. Pages shall include the date. STS may use pre-printed Field Logbooks in which some of these items are filled in. Each Field Team Leader and other field personnel taking measurements, observing tests, or performing other related work, will be issued a Field Logbook.

5.1.2 The first set of pages for a day will include the following items (in the order indicated):

- personnel on-site
- contractor personnel on-site (names of employees for the companies represented)
- others on-site (e.g., regulators, visitors)
- weather
- equipment used
- equipment calibration
- sketch of work area
- summary of work.

5.1.3 The remaining pages for a day will record the field activities and should include the following:

- meetings (meeting attendees, person who called the meeting, time, location, decisions, and decision makers)
- start and end time of activities.
- visits by others
- regulator - directed activities
- comments made by regulator, visitor, or other persons visiting Site
- weather and working conditions
- general description of work area.
- sketch work areas and show significant relative locations, etc.

- progression of work (e.g., faster or slower, reason for delays)
- description of equipment used, including general name, brand name, model number and, calibration
- description of amount of material excavated and levels of contamination observed (if known)

5.2 Quality Control

5.2.1 The Field Team Leader, or his designee, will review field logbook for completeness, proper field note correction (single line strikeout), and content.

5.2.2 Field logbooks will be audited at the discretion of the Project Quality Assurance Supervisor.

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Excavation Procedure

Document: SOP-217

Revision Number: 0

Date: June 19, 2002 Replaces: New

EXCAVATION PROCEDURE

1. PURPOSE

To provide a procedure for excavation for the Site.

2. SCOPE

This procedure will cover Site excavation activities, which are deemed quality critical by the Project Coordinator

3. REFERENCES

1992, NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, Draft Report.

4. EQUIPMENT AND MATERIAL

None

5. INSTRUCTIONS

5.1 Delineation of extent

5.1.1 Delineate initial areas and depths. Areas and depths will extend slightly beyond estimated extent of impacted soil. Initial areal extent will be established using previously completed walkover gamma surveys and down-hole exploration and sampling information, supplemented with gamma survey data.

5.1.2 Initial excavation limits to be within three inches of the estimated bottom limit.

5.2 Excavate delineated soil mass.

5.3 Sampling scheme

5.3.1 Re-establish survey grid.

5.3.1 Locate diagonals across grid square.

5.3.2 Survey the bottom of the excavation as described in SOP-210.

5.4 Pre-Verification or Verification Sampling

5.4.1 If all measurements within a grid are less than the cleanup criteria limit, then grid is clean. No further excavation is required in this grid.

5.4.2 If any measurements within an excavation are greater than the action criteria limit, then additional excavation is required.

5.4.2.1 Proceed through sequence 5.2 through 5.4 again.

5.4.2.2 Mark subareas around grid points that exceeded the action limit.

5.4.2.2 Contact Field Team Leader for guidance of additional excavation.

5.5 Completion

5.5.1 After grid has met criteria, give documentation of delineation, excavation, and sampling to Field Team Leader.

5.5.2 Grid is available for Pre-Verification or Verification Surveying.

6. QUALITY CONTROL

6.1 Quality control for the excavation documentation will be in accordance with applicable SOPs.

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Verification Survey

Document: SOP-223

Revision Number: 0

Date: June 19, 2002 | Replaces: New

VERIFICATION SURVEY PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to present protocol for conducting verification surveys at the excavations at the Site.

2.0 SCOPE

This procedure applies to all completed excavations that are done as a result of the excavation area being identified as containing soil exceeding the cleanup criteria.

3.0 REFERENCES

SOP-210 - Gamma Radiological Survey

4.0 EQUIPMENT AND MATERIALS

None

5.0 PROCEDURE

5.1 Equipment and Materials

Equipment used for verification survey may include the following:

5.1.1 Compass or theodolite

5.1.2 Cloth or steel tape

5.1.3 Stakes, survey flags, or spray paint

5.2 Grid Layout

5.2.1 The verification survey will be conducted at all excavations.

5.2.2 The grid used for the STS Survey, or similar locations will be re-established for the verification survey.

5.2.3 The diagonals across each grid square will be located.

5.2.4 The location halfway between the grid corner and the center of the grid will be located.

5.3 VERIFICATION

5.3.1 Measurements will be made according to the procedures described for Gamma Radiological Surveys (SOP-210).

5.3.2 If all measurements within a grid are less than the cleanup criteria limit, then grid is clean. No further excavation is required in this grid.

5.3.3 If any measurements within an excavation are greater than the action criteria limit, then the Field Team Leader shall guide additional soil removal until the excavation measures below the cleanup criteria.

6.0 DOCUMENTATION

6.1 A scale drawing of the survey area showing the locations and results of the gamma measurements will be created.

6.2 The drawing and gamma measurements will be delivered to the USEPA with a Notice of Successful Verification and a request for approval to backfill the excavation (Form SOP 223-1).

7.0 QUALITY CONTROL

7.1 Quality control for the verification documentation will be in accordance with applicable SOPs.

FORM 223-1
NOTIFICATION OF SUCCESSFUL VERIFICATION SURVEY

Area Identification: ______________________________

Date of Verification Survey: ______________________________

Time of Verification Survey ______________________________ am/pm

The above-described excavation was surveyed at the time and date indicated above. The survey indicated that all soils have been removed as required by the Site Removal Action Criteria.

Documents pertaining to this survey are attached for review and approval by the USEPA.

Signed:

Date ______________________________

Print Name ______________________________

Print Title ______________________________

STS Consultants, Ltd.

The attached Verification Survey documents were reviewed by USEPA, Region 5 on ______________________. The results of this survey indicate that the verification criteria as contained in the UAO, have been met.

Authorization is hereby granted to commence backfill and restoration work at this excavation.

Date ______________________________

Print Name ______________________________

Print Title ______________________________

For USEPA Region 5

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Radioactive Material Shipments

Document: SOP-320

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

RADIOACTIVE MATERIAL SHIPMENTS

1.0 SCOPE

1.1 Purpose

To establish a procedure that will insure the safe and proper shipment of radioactive waste material in compliance with USEPA, NRC, and DOT regulations.

1.2 Applicability

This procedure is applicable at all times for LSA shipments of radioactive materials destined for disposal at EnviroCare of Utah's Clive, Utah Facility.

2.0 REFERENCES

- 32 Illinois Administrative Code, Parts 310 and 340, Standards for Protection Against Radiation
- 32 Illinois Administrative Code, Part 400, Notices, Instructions and Reports to Workers; Inspections
- Lakeshore East Health and Safety Plan Remedial Action.
- 10 CFR Part 20.1906
- 10 CFR Part 71.47 and 71.87
- 10 CFR Part 71 Statements of Consideration
- 49 CFR Parts 172, 173, 174 and 177
- 32 Illinois Administrative Code, Part 341, Transportation of Radioactive Material
- Utah Radioactive Material License No. SMC-1559 with current amendments issued to EnviroCare of Utah, Inc.

3.0 DEFINITIONS

3.1 Definitions for transport are defined in 49CFR §171.108

This is the maximum activity of special form radioactive material permitted in a Type A package.

3.2 Limited Quantity of Radioactive Material

This is the quantity of radioactive material that does not exceed the materials package limits specified in 49 CFR 173.425 and which conforms with the requirements specified in 49 CFR 173.421.

4.0 REQUIREMENTS

4.1 Prerequisites

4.1.1 A copy of the consignee's up-to-date radioactive material license shall be on file at the Kerr-McGee West Chicago facility office so the Site Manager or his designee can verify that the consignee is licensed to receive the radioactive material.

4.1.2 All containers shall be inspected by the Project Coordinator or designee prior to loading and palletizing, to insure that the container's integrity is adequate, and then inspected again to insure that the containers have been loaded and closed in accordance with applicable procedures.

4.1.3 For shipments of radioactive material for disposal, compliance with disposal site facility criteria and specific state and federal license provisions applicable to the material shall be verified by Project Coordinator.

4.1.4 For packages of radioactive waste material intended for shipment to EnviroCare of Utah for disposal, the Project Coordinator or designee shall verify that the pre-shipment characterization process has been completed.

4.2 Tools, Material, Equipment

4.2.1 Calculator.

4.2.2 Packaging, labels and containers

4.3 Precautions Limits

4.3.1 Radioactive waste material that is to be shipped for disposal must be classified according to 32 IAC 340.1052 and meet the requirements of 32 IAC 340.1055.

4.3.2 The maximum permissible limits for removable contamination for a package:

Contaminant	Bq/cm^2	$\mu Ci/cm^2$	Dpm/cm^2
Beta/gamma emitting nuclides; nuclides with $T_{1/2}$ <10 days; natural uranium; natural thorium; U-235; U-238; Th-232; Th-228; and Th-230 when contained in ores or physical concentrates.	0.4	10^{-5}	22
All other alpha emitting nuclides	0.04	10^{-6}	2.2

NOTE: In cases of packages transported as exclusive use shipments by rail or highway, the non-fixed radioactive contamination must not exceed the above limits at the beginning of transport, and, at any time during transport, must not exceed 10 times the above limits.

4.3.3 The radiation levels at any point on the external surface of the package must not exceed 200 mrem/hr and the Transport Index must not exceed 10. Packages transported as exclusive use by rail or highway may exceed these limits provided that the following conditions are met:

	Open Vehicle	Closed Vehicle
Package Surface	≤ 200 mrem/hr	≤ 1000 mrem/hr
Vehicle	≤ 10 mrem/hr at 2 meters from vertical planes	≤ 200 mrem/hr at any point on the outer surface of the vehicle ≤ 10 mrem/hr at 2 meters from vertical planes ≤ 2 mrem/hr in cab

4.4 Acceptance Criteria

4.4.1 Radioactive material has been properly prepared, packaged, marked, labeled, and loaded onto a vehicle and is in proper condition for transport.

4.4.2 All necessary forms, surveys, and manifests have been prepared and the "shipping papers" packet is complete.

4.4.3 All necessary state and local authorities and material receivers have been properly notified of the shipment.

4.4.4 All necessary paperwork has been completed and signed and a copy of the "shipping papers" packet has been filed for Kerr-McGee's records.

4.4.5 For *radioactive* waste shipments for disposal, confirmation of receipt at the disposal facility is acknowledged within 20 days of shipment, or an investigation is initiated.

5.0 PROCEDURE

5.1 Verify that the intended consignee (receiver) of the material has a valid license to accept the type and quantity of radioactive material.

NOTE

Typically, groundwater samples, surface water samples, and environmental air samples that are shipped offsite do not meet the regulatory definition of "Radioactive Material" and therefore do not require radioactive material shipping paperwork.

5.1.1 The A_1 and A_2 values for radionuclides are the limits in curies from which a shipment type is determined.

5.2 Determine the following information for inclusion on the bill of lading ***and/or the radioactive waste shipment and disposal record*** form for each package in the intended shipment:

5.2.1 Proper shipping name and hazard class from 49 CFR 172.101, Columns 2 and 3.
5.2.2 Proper UN identification number from 49 CFR 172.101, Column 3.a.
5.2.3 Principal radionuclides (greater than 1% of total activity).
5.2.4 Determine whether or not Reportable Quantity (RQ) must appear on the bill of lading per 49 CFR 172.203(c)(2)

a. Using Table 2 of Appendix to 49 CFR 172.101, determine if a single radionuclide exists as a reportable quantity.
b. If a mixture of nuclides exists, use the sum of the ratios of the quantity of a nuclide per package and the RQ for the nuclide. A package contains an RQ of a hazardous substance when the sum of the ratios is ≥ 1.
c. If the quantities or identities of some of the nuclides in a package are unknown, follow the instructions found in the Appendix to 49 CFR 172.101 step 6 for RQ determination. .

5.2.5 Physical and chemical form of material.

5.2.6 Net quantity (activity) in each package.

5.2.7 For each shipment of radioactive material, emergency response information must be maintained during transportation and at facilities where hazardous materials are loaded for transportation or otherwise handled during any phase of transportation.

a. Emergency response information is not required for shipments of radioactive materials excepted from the shipping paper requirements of subchapter C of 49 CFR, such as those shipments designated as limited quantity.

b. Complete Emergency Response Information form (Attachment 2) and include with the shipping papers for the radioactive material shipment.

5.3 If the package of radioactive material is to be shipped for disposal, the following are additional required steps:

5.3.1 Use Radioactive Waste Shipment Checklist (Attachment 3) for shipments to a disposal facility.

5.3.2 Verify that the radioactive waste material has been classified in accordance with 32 IAC 340.1052.

5.3.3 Verify that the package's records meet the radwaste material form requirements of 32 IAC 341.1055.

5.3.4 Use EnviroCare's Radioactive Waste Shipment and Disposal Record form 540 and 541 as the manifest form for all shipments of radioactive waste material going to EnviroCare of Utah, Inc.

5.3.5 Mail or otherwise send, separate from the shipment, a copy of the disposal site shipping manifest to the disposal facility operator. This copy of the shipping manifest may be sent the same day that the shipment leaves tile site.

5.3.6 The disposal site operator is required to acknowledge receipt of the shipment within seven (7) days of arrival by returning a signed copy of the first page of the shipping manifest to the shipper.

5.4.7 Verify and document on the Radioactive Waste Shipment Checklist. (Attachment 3) that the return receipt for the shipment has been received within 20 days of shipment.

For shipments whose receipt has not been acknowledged within 20 days, initiate a trace investigation in accordance with 32 IAC 340.1060(h).

5.4 For packages shipped by rail or highway under the "EXCLUSIVE USE" provisions of 49 CFR 173.403 (i), the following additional steps are required:

5.4.1 Verify, that the certification statement of 49 CFR 172.204: "This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulation of the Department of Transportation," appears on the shipping paper, and is signed by the Project Coordinator, or his designee.

5.4.2 If a Radioactive Yellow II label is required, record the package contents (radionuclides), number of curies, and Transport Index (TI) on the label. Affix label to two opposite sides of the package (excluding the bottom) near the proper shipping name.

5.4.3 Verify that the radioactive material has been properly prepared, packaged, marked, labeled, and loaded on the vehicle.

5.4.4 Ensure that package radiation and contamination surveys have been performed and documented, and that package radiation and contamination levels are within the limits specified in Section 4.3.

5.4.5 Ensure that the vehicle has been completely tarped, blocked and braced, or the packaged material sufficiently restrained to preclude movement within the vehicle during normal transport.

5.4.6 Ensure that the vehicle or rail car is properly placarded and marked per Subpart D and F of 49 CFR 172. If placarding is required and shipment is by vehicle, all four sides must have placards.

5.4.7 Verify that a radiation survey of the loaded vehicle has been performed and documented on Shipment Load Diagram (Attachment 5).

5.4.8 Complete Form Exclusive Use Vehicle Instructions to Carrier (Attachment 6), and have the vehicle operator read the exclusive use statement and acknowledge compliance his or her signature, and include a signed copy with the shipping papers.

5.4.9 Contact the Project Coordinator, or his designee, for final inspection of the vehicle, cargo and paperwork.

5.4.10 Insure that the carrier (vehicle operator) has all the required shipment papers, and appropriate copies have been retained for the site files.

5.5 For packages shipped as other than exclusive use, ensure completion of the following:

5.5.1 Certification statement of 49 CFR 172.204: "This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation," appears on the shipping paper and is signed by the Project Coordinator or his designee.

5.5.2 Package external radiation level is less than 200 mR/hr contact and 10 mR/hr at one meter.

5.5.3 Package external contamination level does not exceed 2200 dpm/100 cm^2 β and 220 dpm/100 cm^2 $\propto$

5.5.4 If the radiation level on the external surface of the package is greater than 0.5 mR/hr and less than 50 mR/hr, and the radiation level at 1 meter is less than 1 mR/hr the package may be shipped as a Radioactive Yellow II shipment.

Ensure that the shipping container meets the DOT Specification 7A Type A general packaging requirements per 49 CFR 173.415.

5.5.5 If a Radioactive Yellow II label is required, record the package contents (radionuclides), number of curies, and TI on the label. Affix label to two opposite sides of the package (excluding the bottom) near the proper shipping name.

5.5.6 Package is marked correctly in accordance with 49 CFR 172 Subpart D.

5.5.7 Ensure vehicle radiation and contamination surveys have been performed.

5.5.8 Placarding requirements in Subpart F of 49 CFR 172 are met.

5.5.9 Final inspection of the vehicle, cargo, and paperwork is performed by Project Coordinator, or his designee.

5.5.10 For radioactive waste shipments, the disposal facility operator is required to acknowledge receipt within one week by returning a signed copy of the manifest.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Shipping records shall be maintained by the Project Coordinator. A complete shipment record packet includes copies of all completed and signed paperwork that accompanied the shipment.

6.2 Anyone who observes a deficiency in complying with this procedure shall notify Project Coordinator or his designee.

7.0 ATTACHMENTS

7.1	Attachment 1	Example Bill of Lading-Short Form (for Exclusive Use)
	Attachment 1A	Example Bill of Lading – Short Form for Material>2 N/gm <RQ
	Attachment 1B	Example Bill of Lading – Short Form for Material >2 N/gm >RQ
7.2	Attachment 2	Emergency Response Information Form
7.3	Attachment 2A	Emergency Procedure Form
7.4	Attachment 2B	Evaluation Questionnaire Form
7.5	Attachment 3	Radioactive Waste Shipment Checklist
7.7	Attachment 5	Shipment Load Diagram - Truck
7.8	Attachment 6	Exclusive Use Vehicle Instructions To Carrier

ATTACHMENT 1

STRAIGHT BILL OF LADING - SHORT FORM

ATTACHMENT 1 *(Example)*

STRAIGHT BILL OF LADING - SHORT FORM - Original - Not Negotiable

RECEIVED, subject to the contract in effect on the date of the issue of this Bill of Lading

From: KERR-McGEE CHEMICAL CORPORATION	

the property described below in apparent good order, marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all terms and conditions of the contract in effect on the date of the issue of this Bill of Lading

SHIPMENT NUMBER

FULL NAME OF SHIPPER:

Kerr-McGee Chemical Corporation

CARRIER:	**TRUCK #:**	**DATE:**	**FROM NO. STATION: STATE**

SHIPPED FROM:	**CONSIGNED TO:**

ROUTE: **DELIVERING CARRIER:**

This material is routed "exclusive use". The vehicle is to remain closed between origin and destination. No material may be added to the vehicle or removed from the vehicle in route.

LINE NO.	**DESCRIPTION AND CLASSIFICATION**	**ESTIMATED QUANTITY**
	(Proper Shipping Name, Reportable Quantity, if applicable/ Hazard Class) (Proper UN identification number) (Net activity in each package) (Principal Radionuclides) (Physical and chemical form of material) (Indicate Yellow II on any applicable packages)	

TRUCK SHIPMENTS: PLACARDS REQUIRED

THIS IS TO CERTIFY THAT THE ABOVE-NAMED MATERIALS ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND LABELED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION.

KERR-McGEE CHEMICAL CORPORATION	PER		PER
Shipper Permanent post	office address of	AGENT	shipper,

Oklahoma City, OK 73125

ATTACHMENT 2

EMERGENCY RESPONSE INFORMATION

Shipment I.D. No.____

1. Proper Shipping Name and Hazard Class
   Check one of the two types listed below

   ☐ Radioactive Material, Low Specific Activity, n.o.s. - Radioactive Material UN 2912

   ☐ Radioactive Material, n.o.s. - Radioactive Material UN 2982

DRIVER EMERGENCY PROCEDURE

A) RESCUE and LIFESAVING may be done with little fear of the hazards from the cargo on this truck. If possible, avoid breathing dust from any spilled cargo.

DO NOT DELAY RESCUE EFFORTS!

B) After providing needed rescue, lifesaving, first aid or fire-fighting, please read the attached instructions in the event of cargo spillage.

TO THE DRIVER:

Keep these emergency procedures with your shipping papers.

By my signature I certify that I have read and understand these emergency procedures.

Driver's Signature: ____

ATTACHMENT 2A
EMERGENCY PROCEDURE

This vehicle contains ____soil or debris____________________, which are contaminated with natural thorium. In the event of an accident involving spillage of radioactive material, the following actions are recommended, if appropriate:

1. LIFESAVING, RESCUE AND FIREFIGHTING

This may be done with little fear towards the hazards from the debris contaminated with thorium. If possible, avoid breathing dust and avoid swallowing it. Thorium on the skin or clothing is relatively harmless and simple washing methods will remove it. If you come into contact with the debris, please wait for advice from health officials. To avoid ingestion of thorium, do not eat, drink, or smoke while near the spill.

2. CONTACT THE LOCAL LAW ENFORCEMENT AGENCY

Tell the police of the accident with spillage of "LOW SPECIFIC ACTIVITY" (LSA) radioactive material called natural thorium. Ask them to notify the state health department. Give them the location of the accident site and tell them of any injuries to persons.

3. FILL OUT ATTACHED QUESTIONNAIRE

Please obtain all of the information asked for on the attached form. You will need to relay this information to the carrier and the shipper.

4. Telephone the Carrier and Shipper (call collect)

   a) The Trucking Carrier is: Double M Trucking ____________________
   Telephone No.: 815-223-1828 ____________________________

   b) The Shipper is:
   Telephone No. ____________________________________

Read the completed questionnaire to whoever answers your calls. It may be necessary to read the questionnaire a second time for complete understanding.

5. When help arrives please cooperate with all Civil Authorities and Carriers and Shipper's personnel who arrive at the scene. Follow their health safety instructions for checking possible contamination of your clothing or body.

   Please be assured that your exposure to this material will be relatively harmless, particularly if you have followed these instructions. The health and safety personnel who will arrive will be glad to answer any questions you have about this matter

ATTACHMENT 2B
EVALUATION QUESTIONNAIRE

1. Name of truck driver

2. Name of trucking company ____________________

3: Bill of lading number

4. Destination of shipment ____________________

5. Date and time of accident ____________________

6. Place of accident ____________________

7. Name of Police Department notified ____________________

8. Phone Number of Police notified ____________________

9. Is the driver injured? ____________________ Others? ____________________

10. Is or was there a fire? ____________________

11. Is the truck road worthy? ____________________

12. Are boxes off of the truck? ____________________ How many? ____________________

13. Estimate the number of square feet of spilled material ____________________

14. Has the spill been covered? ____________________

15. Is the spill on the ground? ____________________ Pavement? ____________________
16. Is the spill in water? ☐ Yes ☐ No **Lake**? ☐ Yes ☐ No **Stream**? ☐ Yes ☐ No
17. Is the spill near a building? ☐ Yes ☐ No **Sewer**? ☐ Yes ☐ No

18. Is the accident place illuminated at night? ____________________

19. Other comments: ____________________

20. Where can you be reached by phone? ____________________

a) Near the accident site ____________________
b) Home or business phone ____________________
c) Your name: ____________________

ATTACHMENT 3
RADIOACTIVE WASTE SHIPMENT CHECKLIST

DATE ______________________________ BY ____________________________________

SHIPMENT NO. ______________________ CONSIGNEE ____________________________

NOTE: Initial each statement as being completed or fill in the blank with appropriate comment(s). N/A is acceptable for those steps not required for this particular shipment.

_____ 1. General description

_____ 2. Consignee license reviewed and consignee authorized to receive type and quantity of material in shipment.

_____ 3. Number of packages in shipment. (Indicate number of packages of each type of waste.)

_____ 4. All containers inspected by Project Coordinator, or designee, to ensure compliance with all applicable laws, rules and regulations, including labeling, obliteration of old markings, radwaste classification/stability, gross weight, and package specifications.

_____ 5. A determination has been made whether or not any package in this shipment is a Reportable Quantity.

_____ 6. If this is an "Exclusive Use" shipment, the packages are loaded and blocked and braced or otherwise restrained to prevent movement.

_____ 7. Placard the vehicle per Subpart F of 49 CFR 172. For tractor-trailers, placard each side of the trailer and place one on the front of the tractor. For rail shipments, a placard must be visible on each side of a rail car not coupled to another car.

_____ 8. If applicable, the required tamper proof seals are installed.

_____ 9. EMCCs Straight Bill of Lading- Short Form, (Attachment 1, 1A or 1B) has been completed. Normal copy distribution if applicable is as follows:

a. Project files.

b. With shipment. Note: if radwaste material, the copy goes in the disposal site paperwork package.

c. With driver paperwork package.

NOTE: The following step applies to shipments for disposal at the EnviroCare of Utah facility only.

______ 10. The EnviroCare of Utah facility's Radioactive Waste Shipment Record, is complete.

Copy distribution:

a. Original with shipment paperwork package.
b. Copy to project files.

______ 11. The "EXCLUSIVE USE" Vehicle Instructions to Carrier, (attachment 6); his been completed.

Copy distribution:

a. Original with driver's paperwork package.
b. Copy with shipment paperwork package.
c. Copy to WCP Project files.

______ 12. Radiation surveys have been performed.

Copy distribution:

a. Original to project files.

______ 13. Receipt of radwaste material has been acknowledged by the disposal site operator within allotted time (10 days).

Copy distribution:

a. One copy to project files

______ 14. Vehicle check performed.

Reviewed by: ______________________________ Date ________________
Project Manager or Designee

ATTACHMENT 5

SHIPMENT LOAD DIAGRAM - TRUCK

SHIPPER ____________ CAB NUMBER ________ TRAILER NUMBER ____
SURVEY BY ____________ SHIPMENT N0. ________ DATE ________

TRUCK CHECKED FOR CONTAMINATION:

BEFORE LOADING: ☐ < 02200 dpm/100 cm^2 beta-gamma ☐ < 220 dpm/100 cm^2 alpha

☐ CONTAMINATED TO ____________________________

RADIATION LEVEL, MR/hr ____________ CONTAMINATION LOCATION ____________

AFTER LOADING: ☐ < 02200 dpm/100 cm^2 beta-gamma ☐ < 220 dpm/100 cm^2 alpha

Cab ____________ mR/hr
(Sleeper)

Front of Van

Surface ______ mR/hr

6' ________ mR/hr

Right Side

Surface ______ mR/hr

6' ________ mR/hr

Left Side

Surface ______ mR/hr

6' ________ mR/hr

Top of Truck

Surface ______ mR/hr

6' ________ mR/hr

Under Truck

Surface ______ mR/hr

Rear Surface ________ mR/hr

6' ____________ mR/hr

ATTACHMENT 6
"EXCLUSIVE USE" VEHICLE INSTRUCTIONS TO CARRIER

SHIPMENT NO. ________________________________ Date ______________________

1. This shipment of radioactive material is being transported as an EXCLUSIVE USE shipment, loaded by the consignor and may only be unloaded under the direction of the consignor or consignee [49 CFR 173.403 (i)].

2. Any removal, addition to, or movement of, any material in this shipment by anyone, except under the direction of the consignee or consignor, shall constitute a violation of federal law.

3. A closed van shipment shall not be opened, nor shall any shipment be changed or modified in any manner, except by the consignee, without the prior authorization of Kerr-McGee Chemical LLC. No change of tractor is authorized without prior approval of Kerr-McGee Chemical LLC. Do not move the 5th wheel of the tractor once the shipment has left the Lakeshore East site.

In the event of an emergency, accident, or contemplated deviation from any the above instructions, notify Kerr-McGee Chemical LLC at ________________. Routine inspection of placarding is required at all "off the road" stops.

Signature ____ Date ______________________

CARRIER ACKNOWLEDGEMENT:

I have read and understand the foregoing instructions. I agree that this shipment will be made in full accordance with these instructions.

Signature ____ Date ______________________

Print Name ______________________________________

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Surveys for Surface Contamination and Release of Equipment for Unrestricted Use

Document: SOP-345

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

SURVEYS FOR SURFACE CONTAMINATION AND RELEASE OF EQUIPMENT FOR UNRESTRICTED USE

1.0 SCOPE

1.1 Purpose

This procedure provides the methods for the detection and measurement of radioactive contamination within the site areas, it provides the methods for evaluating contamination, and establishes the criteria for releasing equipment or materials out of the Exclusion Zone. These methods are to be used to minimize the spread of radioactive contamination.

1.2 Applicability

This procedure applies to surveys that are performed on building surfaces, vehicles, equipment, materials (herein referred to as equipment) at the site and to the site personnel, who are required to monitor and release the equipment.

2.0 REFERENCES

2.1 10 CFR Part 20 Standards for Protection Against Radiation

2.2 U. S. Nuclear Regulatory Commission (USNRC) Regulatory Guide 1.86

2.3 Health and Safety Plan for radiologically impacted soil removal, Lakeshore East Development, Chicago, Illinois.

2.4 NUREG CR5849 Manual for Conducting Radiological Surveys in Support of License Termination

3.0 DEFINITIONS

3.1 Beta-Gamma to Alpha Decay Ratio

A thorium-232 decay series produces about 0.5 beta-gamma decays for every one alpha decay. This ratio allows the limits for alpha contamination to be verified using beta-gamma survey instruments.

3.2 Clean Area

This term defines radiation conditions within a specified area. An area where the radiation levels and contamination levels are maintained below 2 mrem/hr and 33 dpm/100 cm^2 alpha respectively.
Contamination Surveys

An assessment that may include, as appropriate, surveys for loose and fixed contamination through the use of direct frisks, large area wipes and smears, to locate and quantify the radioactive material present.

3.4 Exclusion Zone

The area on one side of the Control Line that includes Contamination Control Areas, Radiation Areas, and Airborne Radioactivity Areas.

3.5 Large Area Wipes (LAWs)

Paper towels or muslin used to wipe large areas to identify the presence of loose contamination.

3.6 Lower Limit of Detection (LLD)

The smallest amount of a radionuclide in a sample that will be detected with a probability of non-detection (Type 1 error) while accepting a probability of erroneously detecting that radionuclide in a blank sample (Type II error). These probabilities are 0.05 (5% chance of Type I or II errors). See Attachment 5 - "LLD Calculation" sheet.

3.7 Smears

Typically 2 inch disk type paper material. Smears are normally taken to identify and quantify loose contamination.

3.8 Unrestricted Release

Release of equipment or materials from the Exclusion Zone to any destination other than a licensed facility.

4.0 REQUIREMENTS

4.1 Prerequisites

4.1.1 Health Physics personnel shall ensure that all portable survey equipment used for this procedure are properly functioning and have a valid calibration sticker.

4.1.2 The Health Physics Supervisor or designee shall ensure that all personnel who are required to perform this procedure are properly trained and understand this procedure.

4.1.3 Equipment, vehicles and areas should be free of visible dirt, mud or dust prior to performing a contamination survey.

4.2 Tools, Material, Equipment

4.2.1 The following counting equipment, or their equivalents, should be used for performing contamination surveys on equipment and materials:

- Personnel and Equipment Frisking: Ludlum Model 3 Survey Meter with attached pancake G-M probe

- Alpha Smear Counting: Ludlum 2200 Scaler with attached Model 43-10 Alpha Scintillation Counter

4.2.2 Survey Maps (or lists) should be produced for each applicable type of equipment. Sketches of building surfaces (walls, floors, etc.), identifying the surveyed grids, should be produced for each surveyed building.

4.3 Precautions, Limits

4.3.1 Direct and removable surveys should not be performed on wet surfaces for alpha contamination. Wet surfaces should be surveyed only for beta-gamma contamination. However, the Health Physics Supervisor shall make the final determination as to when a wet surface is to be surveyed.

4.4 Acceptance Criteria

4.4.1 Prior to unrestricted release from the Exclusion Zone, all vehicles, equipment and materials shall be surveyed for contamination. If contamination is found, then the vehicle, equipment, or material should be decontaminated in order to be within the applicable surface contamination release limits per Attachment #3 and Attachment 6 (Beta-Gamma Survey of Truck Tires) shall be used as a guideline for meeting Department of Transportation (49CFR173.443) release criteria, when performing surveys on wet surfaces.

4.4.2 The release of items from clean areas within the Exclusion Zone will be controlled by specific criteria established on a case by case basis and approved by the Health Physics Supervisor.

5.0 PROCEDURE

5.1 Routine Surface Contamination Surveys

5.1.1 Routine surveys shall be performed by trained personnel (typically by Health Physics Technicians), in accordance with this procedure and as scheduled by the Health Physics Supervisor.

5.1.2 Routine contamination surveys are not required in the Exclusion Zone.

5.1.3 Support Zone and Contamination Reduction Zone shall be surveyed at least weekly to ensure that cross contamination is not occurring. The clean side of the Contamination Reduction Zone should be surveyed each work day.

5.1.4 Other surveys will be performed, as appropriate, to support Special Work Permits, the movement of equipment from radioactive material areas to clean areas, and to evaluate radiological conditions in specific work areas when directed by the Health Physics Supervisor.

5.2 Support/ Contamination Reduction Zone- Surface Contamination Surveys

5.2.1 Survey techniques may employ the use of large area wipes, smears, or direct frisks as appropriate to the area being surveyed.

5.2.2. Large area wipes may be used to assess floor areas for contamination. A sufficient number of large area wipes should be used to evaluate approximately 10% of the floor area being surveyed.

5.2.3 If contamination is found with the large area wipes, a more detailed smear survey should be performed.

5.2.4 Counter tops, office furniture, laboratory equipment, etc., should be included in the contamination surveys. The area immediately on the clean side of the Control Line should be included in the survey.

5.2.5 Smears shall cover approximately 100 cm^2 and should focus on areas with the highest potential for removable contamination. The smears should be placed in an envelope that is labeled with a sequential number corresponding to the Smear Number on the Radiological Survey Data Sheet (see Attachment 1).

5.2.6 The smears shall be analyzed for alpha contamination.

5.3 Equipment- Surface Contamination Surveys

5.3.1 Equipment shall be surveyed for contamination by using large area wipes, smears and by direct frisk as appropriate.

5.3.2 Take an appropriate number of smears to adequately assess the radiological conditions of the item being surveyed.

5.3.3 A large area wipe may be used as an indication of the presence of contamination.

5.3.4 Smears shall cover approximately 100 cm^2 and should focus on areas with the highest potential for removable contamination. The smears should be placed in an envelope that is labeled with a sequential number corresponding to the Smear Number on the Radiological Survey Data Sheet (see Attachment 1).

5.3.5 The smears shall be analyzed for alpha contamination.

5.4 Unrestricted Release

5.4.1 Materials, equipment and vehicles shall be surveyed for contamination prior to unrestricted release from the site, using large area wipes, smears, and by direct frisk.

5.4.2 All building surfaces, large concrete pieces, and other materials having large, smooth surfaces shall be surveyed prior to unrestricted release. A sufficient number of large area wipes and/or smears shall be taken to adequately assess any contamination present.

5.4.3 All equipment intended for unrestricted release from contaminated areas shall be surveyed for removable and fixed contamination. A sufficient number of large area wipes and/or smears shall be taken to adequately assess any contamination present. If removable contamination is within the release criteria, then perform a direct alpha frisk. Particular attention should be given to areas of the vehicle most likely to have become contaminated such as tire exterior surfaces, occupied areas, load areas, wheel wells, and the bottom of the equipment.

5.4.4 Vehicles intended for unrestricted release from contaminated areas shall be surveyed for removable contamination with large area wipes. If no contamination is found, take a confirmatory smear to document each large area wipe. If contamination is found, take an appropriate number of smears to evaluate the removable contamination present. If removable contamination is within the release criteria, then perform a direct alpha frisk. All survey results must be documented.

5.4.5 Vehicles intended for unrestricted release from clean areas in the Exclusion Zone shall be surveyed with large area wipes on accessible tire/track surfaces, with a direct frisk of tire/track surfaces, and with one smear each for two tires The results of the direct frisk and the large area wipes must indicate that the release criteria is met. The smears shall be added to the survey documentation when the results become available.

5.4.6 Large area wipes may be used as an indication of the presence of contamination.

5.4.7 If no contamination is found with a large area wipe, a confirmatory smear shall be taken for documentation.

5.4.8 If contamination is found with the large area wipe, a representative number of smears shall be taken to quantify the removable contamination present.

5.4.9 Smears shall cover approximately 100 cm' and should focus on areas with the highest potential for removable contamination. The smears should be placed in an envelope that is labeled with a sequential number corresponding to the Smear Number on the Radiological Survey Data Sheet (see Attachment 1).

5.4.10 The smears shall be transported to the Site Laboratory for analysis.

5.4.11 Perform a direct frisk on all material being surveyed for unrestricted release.

5.4.12 Personal equipment and articles (radios, pens, paper, clipboards, etc.) can be surveyed with either the large area wipes or by direct frisk, as appropriate.

NOTE
Items that have irregular surfaces, such as radios, should be wiped and frisked. Items with relatively smooth surfaces, such as paper, pens, etc., may be direct frisked only.

5.5 Documentation of Results

5.5.1 The smear counting results and data shall be documented on the Radiological Survey Data Sheet (see Attachment 1). The documentation of the release survey shall include a drawing of the item to be released.

5.5.2 The instructions for completion of the Radiological Survey Data Sheet are contained in Attachment 2.

5.5.3 A request for equipment release form (Attachment 7) shall be initiated by the equipment owner to track the decontamination process.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 The Health Physics Supervisor and the Project Coordinator (RSO) shall review and approve all completed survey forms required by this procedure, to comply with reference 2.5 above.

6.2 The survey maps shall be uniquely numbered and retained by Health Physics for project filing. Single item survey maps shall be attached to the survey results.

7.0 ATTACHMENTS

7.1 Attachment 1 - Radiological Survey Data Sheet (example)

7.2 Attachment 2 - Radiological Survey Data Sheet Instructions

7.3 Attachment 3 - Surface Contamination Release Limits

7.4 Attachment 4 - Large Area Wipes on Truck Tires

7.5 Attachment 5 - LLD Calculation

7.6 Attachment 6 - Beta- Gamma survey of Truck Tires (wet surfaces)

7.7 Attachment 7 - Request For Equipment Release

Attachment 1

RADIOLOGICAL SURVEY DATA SHEET

Page ___ of ___

Item Description	00 ____ Vehicle		98 _____ Equipment		_____ _____ Building ___ Other
Reference	YR	MO	Day	Item	No.	Performed By:

Alpha Survey Instrumentation	Beta Survey Instrumentation

Location	Smear Number	Alpha Activity (dpm/100cm^2)		Beta Gamma Direct (CPM)
		Direct	Removable	Fixed

REMARKS

Reviewed By:	Date:

ATTACHMENT 2

RADIOLOGICAL SURVEY DATA SHEET INSTRUCTIONS

I. Select the appropriate survey category.

2. Enter the purpose of the survey in the "ITEM DESCRIPTION" section. Be specific:

- Vehicle survey for release from the site.
- Tools and equipment for use in the clean area.
- S WP support, include the S WP number.

3. Enter the survey date.

4. Enter the reference number - Year, Month, Date, Item (Use coding for categories at the top of the form) and Number.

5. Enter your signature in the "PERFORMED BY" section.

6. Enter the instrument(s), serial number(s), and background reading(s) for the survey instruments used for this survey.

7. Enter the "LOCATION OF READING." Enter descriptions such as, the location and item being surveyed, vehicle number, smear location on vehicle, etc.

8. Enter the number of the smear or large area wipe in the "SMEAR NUMBER" section.

9. All data in the "ALPHA ACTIVITY" section is recorded in dpm/100cmz, except large area wipe data.

- If equipment/material is directly frisked, the reading from the Ludlum Model 3 with pancake G-M probe is converted to dpm/100cm~ by multiplying ccpm by a factor of 4 (Gross cpm - Background cpm X 4) and enter the result in the "DIRECT" column. If the instrument response cannot be distinguished from background enter <200 dpm/l00cm^2.
- The "REMOVABLE" column may contain the result from a smear or the result from a large area wipe. Smear results that are less than the LLD shall be recorded as less than the numerical LLD value for the instrument in use. As an example, if the LLD for the 65000 is 3 dpm, then the result will should be recorded as <3 dpm/100cm^2. All results should be rounded to the nearest whole number. Results from LAWs should be recorded as dpm without regard to area, unless specific instructions are given to calculate the result per area, as in Attachment 4. Results that do not exceed background should be recorded as BKG (Background).
- Fixed contamination is the difference between the direct frisk results and the removable contamination results. If no fixed contamination is detectable, enter N/A in the "FIXED" column.

10. If a "BETA-GAMMA DIRECT" survey is performed, record the results as ccpm.

11. In the "REMARKS" section, record any identifying data on counting equipment and any other information needed for explanation or interpretation of survey data. If large area wipes are included in the removable contamination data without regard to area, note this in the "REMARKS" section.

ATTACHMENT 3

SURFACE CONTAMINATION RELEASE LIMITS

Average[a] Removable (dpm/100 cm^2)	Maximum Removable (dpm/100 cm^2)	Average[a] Fixed (dpm/100 cm^2)	Maximum Fixed (dpm/100 cm^2)
33	100	1,000	5,000
Equivalent Beta-Gamma Measurements[b,c]			
17	50	500	2,500

a The contamination levels may be averaged over one (1) square meter provided the maximum activity per any 100 cm^2 area within the one (1) square meter is less than the maximum applicable release limit.

b Beta-gamma release limits derived from the beta-gamma to alpha ratio.

c Beta-gamma surveys are not normally performed for release purposes. If alpha contamination is verified to be within specified release limits, the alpha to beta-gamma ratio indicates that the beta-gamma is also within limits.

Beta-gamma frisks may be used as appropriate to:

- Estimate contamination levels prior to performing release surveys.
- Estimate levels of contamination present on equipment, materials and work areas.

The results of direct beta-gamma frisks should be quantified on survey records as CCPM (Corrected Counts Per Minute).

Results that are less than 100 CCPM should be recorded on the survey record as <100 CCPM.

ATTACHMENT 4

LARGE AREA WIPES ON TRUCK TIRES

Large area wipes are used to wipe an area of approximately 2000 cm^2 on truck tires. The wipes are then frisked with a PAC-4G.

Assuming that 50 cpm above background is readable, it can be assumed that 100 dpm is detectable on a wipe. If the area of the wipe requires two probe areas to cover the wipe, then it can be assumed that we can assess with each measurement approximately half of the total area wiped, or 1000 cm^2 or approximately 100 dpm/1000 cm^2, which is equivalent to 10 dpm/100cm^2.

Frisk results on LAWs, from truck tires, that are nondetectable may be recorded as <10 dpm/100cm^2 in the removable column of the survey report.

ATTACHMENT 5

LLD CALCULATION

$$LLD = \frac{2.71}{T_s} + 3.29 \sqrt{\left(\frac{Cb}{Tb}\right)\left(1+\frac{Tb}{Ts}\right)}$$

Where C_b = Background Counts Per Minute
T_b = Background Counting Time in minutes
T_s = Sample Counting Time in minutes

EXAMPLE: The background count rate for a given counter is 1.56 cpm over a 50 minute counting time and samples are counted for 2 minutes. The counter has an efficiency of 40.3%.

$$LLD = \frac{2.71}{2} + 3.29 \sqrt{\left(\frac{1.56}{50}\right)\left(1+\frac{50}{2}\right)}$$

LLD = 4.32 cpm

$$LLD = \frac{4.32\ cpm}{.403} = 10.7\ dpm$$

ATTACHMENT 6

BETA-GAMMA SURVEY OF TRUCK TIRES

The Department of Transportation removable contamination limits in 49CFR 173.443 are 220 dpm alpha contamination and 2200 dpm beta contamination. The most restrictive is the alpha limit. If weather prevents surveying for alpha contamination, then beta-gamma surveys will have to be utilized. The alpha to beta ratio for the thorium chain is approximately 2:1. Using an alpha to beta ratio of 2, the beta equivalent activity for the alpha limit would equal 110 dpm. 110 dpm times the probe efficiency of 0.14 cpm/dpm equals 15.7 cpm. 15.7 cpm above background is not discernable in the field. The diameter of a truck tire is 43 inches. The tread width is 9 inches. The surface area of a truck tire equals 7843.8 cm^2. Approximately 12 inches of tread is on the ground and not surveyable. This represents 3.5% of the surface area of the tire. The remaining 96.5% equals a surface area of 7569.5 cm^2. The typical area of contact for a wipe is about 3.5 inches by 4 inches. This is equal to about 90 cm^2. If the conservative area of 100 cm^2 is used the each cm^2 of wipe is equal to 57.7 cm^2 of tread area. The manufacturer lists the surface area of the probe face as 15.5 cm^2. The tread area survey under the probe equals 894.4 cm^2. To correct the measured counts to an activity/100 cm^2 the counts indicated on the meter face must be multiplied by 8.9. If 15.7 cpm/100 cm^2 beta-gamma activity equals 220 dpm/100 cm^2 alpha contamination then the measured cpm when surveying a wipe would equal 139 cpm. The manufacturer recommends limiting the background count rate to less than 300 cpm in order to see 100 cpm above background. Due to the changing background conditions this value is being reduced to 200 cpm. Therefore, if background is 200 cpm or less and the wipe on a truck tire reads less than 100 cpm above background the truck tire has less than 220 dpm/100 cm^2 removable alpha contamination.

ATTACHMENT 7
REQUEST FOR EQUIPMENT RELEASE

From: ______________________________ Date: ______________

TO: HEALTH PHYSICS SUPERVISOR

1. Equipment Type and ID # ______________________________

2. Usage History (locations on site)

____
____
____

3. Scheduled Date to Start Decontamination ______________________________

4. HP Check for Survey Readiness: Technician______________ Date ______________

5. Equipment ready for survey ☐ YES ☐ NO

Actions required______________________________
____
____

6.Date and Time Ready for Survey ______________________________

7. Survey Date and Time______________________________

Results: Pass ______________ Fail ______________

8. Equipment Release Date______________________________

9.Approved for Release: HP Supervisor: ______________ Date:______________

NOTE; On large earth moving equipment, substantial cleaning may be required prior to HP checking for survey readiness. Once vehicle has been checked and is ready for release survey, it may take as much as 24 hours from the time the survey is initiated until survey results are available. If fixed or removal is located, additional decontamination and surveys are required.

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Decontamination

Document Number: SOP-347

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

DECONTAMINATION

1.0 SCOPE

1.1 Purpose

The purpose of this procedure is to provide instructions for the decontamination of personnel and equipment.

1.2 Applicability

This procedure is applicable for all equipment and personnel that may become contaminated at the GMO Site.

2.0 REFERENCES

10 CFR Parts 19 and 20

U. S. Nuclear Regulatory Commission (USNRC) Regulatory Guide 1.86

Health and Safety Plan, Lakeshore East Development Radiologically Impacted Soil Removal Action, Chicago, Illinois

SOP-345 "Surveys for Surface Contamination and Release of Equipment for Unrestricted Use"

3.0 DEFINITIONS

3.1 Airborne Radioactivity Area

This term defines radiation conditions within a specified area. An area where the average concentration of airborne radioactivity could allow an individual to exceed 12 DAC-hrs over a one week period.

3.2 Clean Area

This term defines radiation conditions within a specified area. An area where the radiation levels and contamination levels are maintained below 2 mrem/hr and 33 dpm/100 cm^2 alpha respectively.

3.3 Contamination Control Area

This term defines radiation conditions within a specified area. An area that may be contaminated to a level greater than a Clean Area.

3.4 Contamination Reduction Zone

The area on one side of the Control Line where personnel can decontaminate, remove their personal protective clothing and equipment.

3.5 Control Line

The demarcation that separates a Clean Area from a Contamination Control Area. The control line is located in the personnel decon facility.

3.6 Craft Personnel

Employees and contractors who physically perform the activities described on the SWP.

3.7 Derived. Air Concentration-Hour (DAC-hour)

DAC-hour is the product of the concentration of radioactive material in air and the time of exposure to that radionuclide.

3.8 Exclusion Zone

The area on one side of the Control Line that includes Contamination Control Areas, Radiation Areas, and Airborne Radioactivity Areas.

3.9 Film Badge

Similar to the TLD, it is used to measure radiation dose.

3.10 Frisking

A personal survey of an individual's clothing and exposed body performed to determine if contamination is present.

3.11 Protective Clothing

Reusable or disposable coveralls, boots and gloves that provide a barrier between contamination and personnel.

3.12 Radiation Area

This term defines radiation conditions within a specified area. An area where the whole body radiation level is greater than 5 mrem/hr.

3.13 Special Work Permit (SWP)

A document which describes the radiological conditions of the work area or task and delineates safety and radiation protection requirements to be followed in the work area or when performing the task.

3.14 Support Zone

The area on one side of the Control Line at the entrance to the Exclusion Zone.

3.15 Optically Stimulated Luminescence Dosimeter (OSL)

A device that measures radiation dose.

4.0 REQUIREMENTS

4.1 Prerequisites

None.

4.2 Tools, Material, Equipment

4.2.1 Decontamination facility.

4.2.2 Soap, water, high pressure spray, scrub brushes and other material as necessary to decontaminate personnel and equipment.

4.3 Precautions, Limits

Decontamination of personnel with material other than soap and water will only be done when authorized by the Site Manager, Health Physics Supervisor, or a medical doctor.

4.4 Acceptance Criteria

4.4.1 Personnel shall be free of contamination after decontamination.

4.4.2 Material and equipment being decontaminated, for unrestricted release, shall meet the release limits established in Reference 2.4.

5.0 PROCEDURE

5.1 Personnel Decontamination

5.1.1 Personnel who are contaminated to greater than 100 ccpm shall notify the health physics technician (HPT) assigned to the Control Line.

5.1.2 The HPT shall resurvey the individual to determine the exact location of the contamination and document it on the Contaminated Personnel or Personal Effects Report (Attachment 1).

5.1.3 If the contamination is spotty, the HPT shall attempt to decontaminate the individual using swabs or soap and water. If the decontamination is successful, document the results on Attachment 1.

a. If contamination is determined to be in an individual's eyes, the eyes may be flushed, using an eye wash station.

b. If contamination remains in the eyes after flushing or is determined to be in an individual's nose or ears, decontamination will be performed under the direction of the Health Physics Supervisor or qualified medical personnel.

c. Cleansing methods for skin decontamination, in order of harshness are as follows:
1. Lifting off with sticky tape
2. Flushing with water
3. Soap and cool water
4. Mild abrasive soap, soft brush, and water
5. Detergent (soap powder)
6. Mixture 50% powdered detergent and 50% cornmeal

5.1.4 If the contamination cannot be easily removed or the contamination is wide spread, the HPT shall escort the individual to the decontamination facility and notify the Health Physics Supervisor and the Site Manager.

5.1.5 The contamination shall be removed by having the individual wash with soap and cool water several times, if necessary. The methods listed above may be used by the HPT.

5.1.6 If the decontamination is successful, document the results on Attachment 1.

5.1.7 If, after several attempts, the contamination is not successfully removed, notify the Health Physics Supervisor.

5.2 Tool Decontamination

5.2.1 All tools being removed from the Exclusion Zone shall be checked by the HPT.

5.2.2 Tools that are contaminated shall be decontaminated before they can be released from the Exclusion Zone.

5.2.3 Tools shall be decontaminated by the users under the direction of the HPT.

5.2.4 Tools can be decontaminated using scrub brushes and soap and water, wiping with damp rags or wipes, soaking in a decontamination solution, using abrasive materials ultrasonic cleaners, or any other method approved by the HPT.

5.2.5 All interior surfaces of the tools must be decontaminated as well prior to the tool being unconditionally released.

5.2.6 If the tool is decontaminated and released by the HPT, the survey results shall be documented on a Radiological Survey Data Sheet (Reference 2.4).

5.2.7 If the tool cannot be decontaminated after several tries, then the tool shall be painted or sprayed with yellow paint to indicate that the item is radioactive material and kept in the Exclusion Zone.

5.3 Equipment Decontamination

5.3.1 Heavy equipment, such as backhoes, bulldozers, trucks, cranes, shall be washed with high pressure water spray prior to being surveyed by the HPT.

5.3.2 The washing of heavy equipment shall be performed in an area designated by health physics.

5.3.3 Once the equipment is washed, it will be surveyed by the HPT. The HPT will identify any areas on the equipment that need further decontamination and will make recommendations on how to further decontaminate.

5.3.4 All surfaces of the equipment must be decontaminated and surveyed. This includes air intakes, air filters and any internal surface that is likely to be contaminated.

5.3.5 Once the equipment has been surveyed and released by the HPT, the survey results shall be documented on a Radiological Survey Data Sheet (Reference 2.4).

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Release surveys and personnel decontaminations shall be documented on the appropriate form.

6.2 Personal contaminations shall be reported to the Health Physics Supervisor and the Site Manager.

7.0 ATTACHMENTS

7.1 Attachment 1 Contaminated Personnel or Personal Effects Report

ATTACHMENT 1

CONTAMINATED PERSONNEL OR PERSONAL EFFECTS REPORT

Date of Incident	Time of Incident
Name	Badge No.
Location of Incident (Specific Area)	

Description	Describe in Detail Anatomical Location, Contaminant, Type of Injury, or Contaminated Article

Contaminated Article or Area	Decontamination Agent Used	Instrument	Survey Results		Final Disposition of Articles
			Before	After	

Wound Count /5 min	Bkgd Count /5 min	Source Count /5 min

Safety Measures	Pertinent Safety Measures in Effect ☐ Yes ☐ No	If no, explain
Remarks		

Employee Signature	Health Physics Signature

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Sample Preparation Procedure for Gamma Spectral Analysis

Document: SOP-364

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

SAMPLE PREPARATION PROCEDURE FOR GAMMA SPECTRAL ANALYSIS

1.0 SCOPE

1.1 Purpose

The purpose of this procedure is to provide guidance for the preparation of samples for analysis of radioactive nuclides. This procedure applies specifically to samples prepared for NUTRANL analysis.

1.2 Applicability

This procedure applies to all soil-type environmental samples, including soil, rocks, concrete, and construction debris.

2.0 REFERENCES

2.1 10 CFR Part 20 Standards for Protection Against Radiation

3.0 DEFINITIONS

None

4.0 REQUIREMENTS

4.1 Prerequisites

NONE

4.2 Tools, Materials, Equipment

4.2.1 The following equipment is needed to perform this procedure:

- 20 ml sample vials
- Sieve of one-quarter inch mesh
- Analytical balance
- Marinelli beakers
- Zip-lock bags
- Labels
- Paper towels

4.3 Precautions, Limits

4.3.1 Samples prepared for receipt at field laboratory for NUTRANL analysis are homogenized during sample collection prior to receipt at the field laboratory for analysis. No other physical preparation is performed at the laboratory for screening samples (NUTRANL analysis). Any corrections or analysis other than NUTRANL pulse height analysis shall be performed by an outside contract laboratory. This includes U. S. Environmental Protection Agency (USEPA) verification samples and quality control (QC) samples.

4.3.2 All samples not known to be homogenous must be homogenized prior to analysis.

4.3.3 NUTRANL analysis is designed and calibrated for analysis of low activity samples, specifically for documenting closure at less than the specified cleanup criteria. High activity samples may produce anomalous results due to algorithms in the NUTRANL programming.

4.4 Acceptance Criteria

Proper preparation during sample collection ensures that the samples submitted to the laboratory are representative of the material sampled and suitable for the required analysis. Acceptable samples will be homogeneous with regard to size of material; appearance with regard to color, moisture and soil type; shall not contain materials over the specified maximum gradation; and shall be free of external adhering soil or other materials.

5.0 PROCEDURE

5.1 All Samples

5.1.1 All samples submitted for analysis must be logged in the chain of custody book. The following information shall be recorded and shall be taken directly from the field chain of custody form or a copy of the chain of custody form must be filed in the chain of custody book.

- Description or grid location
- Purpose of sample which may include:
  - Activity screening
  - Pre-verification
  - Verification
  - Overburden
  - Imported fill
  - Calibration quality control check
- Date and time of sampling
- Originator of sample
- Corresponding count rate from survey meter (optional)

5.1.2 Ensure that outside of sample container is free from potential contamination, by wiping it clean with a paper towel.

5.1.3 Place blank label on outside of container and record the sample ID, which is a unique sequential number used to identify individual samples. The unique sequential number, sample ID, is obtained from project sample log books.

5.1.4 Weigh the sample on the analytical balance. Subtract the empty (tare) weight which is recorded on the side of each vial and record the net weight in grams on the label.

5.1.5 Prepare the sample in accordance with the requirements of the analysis requested.

5.1.6 Samples will have already been homogenized and passed through a ¼ inch mesh during sampling. It should not be necessary for any samples to be re-opened in the field laboratory. This will eliminate the potential for the field laboratory area to become cross-contaminated. This will also allow for ingrowth. Note will be made on the sample label each time the vial is opened.

5.1.7 Verification samples received for the USEPA are also logged in the chain of custody book. Verification samples are prepared in the same manner as others; however, they come in batches of five 20 ml vials. When samples are to be picked up by the USEPA, place each batch of five sub-samples in its own zip-lock bag.

5.2 Quality Control Samples

5.2.1 QC Samples shall be placed into 500 ml Marinelli beakers prior to analysis.

5.2.2 The technician obtaining the sample shall obtain a split sample into a 20 ml sample vial from the Marinelli beaker. This split is performed in the exclusion zone prior to submitting the sample for analysis. The split sample shall be labeled with the same description as the QC sample. The split sample shall be homogeneous with regard to the remainder of the QC sample.

5.2.3 The net weight of the Marinelli beaker shall be noted on the sample label attached to the beaker. The net weight is obtained by subtracting the weight of the beaker (tare) from the total weight of the filled beaker. The tare (empty) weight of the Marinelli beaker is recorded on the outside of each beaker.

5.2.4 The outside laboratory performing analysis of the QC sample shall be responsible for all additional sample preparation, and requested analysis. This includes moisture correction and/or daughter nuclide ingrowth analysis.

5.2.5 Analyze the split sample (20-ml vial) using the NUTRANL System and retain records for future comparison to gamma spectroscopy results.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Notify the laboratory technician when the samples are properly labeled and ready for analysis.

6.2 Samples shall be retained until all evaluations have been completed and the sample is no longer needed. Samples will not be discarded until written notice is received from USEPA. Samples may be transferred to a secure holding area off-site.

6.3 Retain a paper copy of all sample analysis reports

7.0 ATTACHMENTS

None

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Operation of the ACCUSPEC Gamma Counter

Document: SOP-366

Revision Number: 0

Date: June 19, 2002 | Replaces: New

OPERATION OF THE ACCUSPEC GAMMA COUNTER

1.0 SCOPE

1.1 Purpose

This procedure describes the step for performing gamma spectral analysis of samples utilizing the Accuspec Gamma Spectroscopy system.

1.2 Applicability

This procedure applies to the analysis of samples utilizing the Accuspec Gamma Spectroscopy system.

2.0 REFERENCES

- 32 Illinois Administrative Code, Parts 310 and 340, Standards for Protection from Radiation
- 32 Illinois Administrative Code, Part 400, Notices Instructions and Reports to Workers; Inspections
- ACCUSPEC Installation and Uses Guide, CANBERRA Program Documentation Version 03 March 1990
- RADIOACTIVE DECAY DATA TABLES, D. C. Kocher
- NaI(T1) DETECTORS MODEL 802 SERIES, CANBERRA Operator's Manual
- PHOTOMULTIPLIER TUBE BASE/PREAMPLIFIER MODEL 2007P CANBERRA Operator's Manual
- USNRC Regulatory Guide 4.14

3.0 DEFINITIONS

None.

4.0 REQUIREMENTS

4.1 Prerequisites

4.1.1 The Accuspec system is operational

4.1.2 Samples to be analyzed by the Accuspec system must be in the 20 ml liquid scintillation vial geometry.

4.2 Tools, Material, Equipment

4.2.1 Canberra NaI(T1) detector model 802

4.2.2 Canberra photomultiplier tube base/preamplifier model 2007P

4.2.3 Accuspec gamma spectroscopy program

4.3 Precautions, Limits

4.3.1 Use only plastic liquid scintallation vials 16.7 to 28 mm in diameter.

4.3.2 Power is to remain applied to this equipment. Should power be lost a warm up time of 24 hours may be required upon restart.

4.3.3 Ensure all samples to be analyzed are free from external contamination.

4.4 Acceptance Criteria

4.4.1 Background and Efficiency checks shall be performed daily prior to use.

NUTRANL gamma pulse height analysis software does not employ "target energies" to identify and quantify nuclides. All gamma photopeaks over the range of interest are used. The Packard AccuSpec Gamma Counter system is adjusted to monitor the energy range from 50 to 2,000 keV, inclusive.

The Minimum Detectable Activity (MDA) is as follows:

Counting Time	U-238 pCi/g	Ra-226 pCi/g	Ra-228 pCi/g	K-40 pCi/g
	4.6	1.4	1.3	32

MDA elated in compliance with USNRC Regulatory Guide 4.14 (at 4.65 times the standard deviation of the analysis for the instrument background).

4.4.2 All efficiency checks shall be within 2 standard deviations from the certified activity of the standard measured.

4.4.3 All samples to be analyzed shall be preceded by analysis of the Uranium, Thorium, Radium, Potassium, and Blank standards.

The calibration standards contain U-238 (in secular equilibrium through U-234), Th-232 (in secular equilibrium with progeny), Ra-226 (in secular equilibrium through Po-214), pCi/g K-40. The density of each standard is similar to that of lightly compacted soil (1.5 g/cc). The U-238, Th-232 and Ra-226 standards are traceable to NIST. The K-40 standard is not NIST traceable. The blank is chromatographic grade alumina.

4.4.4 The Canberra system measures and records elapsed time, live time and dead time. The NUTRANL code uses the live time. System dead time is typically 9 to 0% for samples ranging from background up to 1,000 pCi/g Ra.

5.0 PROCEDURE

5.1 Initial Instrumentation Setup

5.1.1 Connect the equipment cables in accordance with the manufactures technical manual.

5.1.2 From the C:> prompt type "START" and press enter to start NUTRANL.

5.1.3 Enter "SETUP" for the category.

5.1.4 Enter."YYMMDDS1" for the sample ID.

5.1.5 Enter "SYSTEM SETUP" for the description.

5.1.6 Press the "ESC" key.

5.1.7 Open the detector shield assembly, place the 20 gram Thorium Standard in the detector, and close the detector shield assembly.

5.1.8 Select "S" to open the SETUP menu.

5.1.9 Select "V" to open the HVPS menu.

5.1.10 Select "L" to open the VOLTAGE LEVEL menu.

5.1.11 Enter "1000" to set the high voltage to 1000 volts.

5.1.12 Select "N" to turn the high voltage on.

5.1.13 Press the "ESC" key to return to the SETUP menu.

5.1.14 Select "A" to open the ADC menu.

5.1.15 Select "G" to open the CONV.GAIN menu.

5.1.16 Select "2" to set the conv. gain to 2048.

5.1.17 Press "ESC" key to return to the ADC menu.

5.1.18 Select "U" to set the ULD, normally set to 100%.

5.1.19 Set the ULD level using the left and right arrow keys and press "ENTER" to lock the setting.

5.1.20 Press "ESC" to return to the ADC menu.

5.1.21 Set the desired LLD level using the COARSE LLD and the FINE LLD menus.

5.1.22 Press "SHIFT-F2" to erase the current spectrum.

5.1.23 Press "F1" to start acquisition.

5.1.24 Collect a spectrum that will determine the channel location of the 74 KeV peak from Thorium.

5.1.25 Adjust the ADC ZERO to place the 74 KeV peak in channel 74.

5.1.26 Repeat steps 5.1.23 to 5.1.25 to adjust the ADC ZERO.

5.1.27 Open the detector shield assembly, remove the Thorium standard, place a Cs-137 source in the detector, and close the detector shield assembly.

5.1.28 Press "SHIFT-F2" to erase the current spectrum.

5.1.29 Press "F1" to start acquisition.

5.1.30 Collect a spectrum that will determine the channel location of the 662 KeV peak from Cs-137.

5.1.31 Adjust the AMP GAIN to place the 662 KeV peak in channel 662.

5.1.32 Repeat steps 5.1.27 to 5.1.30 to adjust the AMP GAIN

5.1.33 Repeat steps 5.1.23 to 5.1.30 to until both the 74 KeV and the 662 KeV peaks are in the proper channels.

5.1.34 Record the ADC, AMP, and HVPS settings in the Accuspec Log Book.

5.2 NUTRANL CALIBRATION

5.2.1 From the C:> prompt type "START" and press enter to start NUTRANL.

5.2.2 Enter "CALIB URANIUM" for the Category.

5.2.3 Enter "YYMMDDC1" for the sample ID.

5.2.4 Enter "URANIUM STANDARD" for the description.

5.2.5 Enter 20.0 for the weight of the sample.

5.2.6 Press the "ESC" key.

5.2.7 Open the shield assembly, place a Cs-137 source in the detector, and close the shield assembly.

52.8 Press "SHIFT-F2" to erase the current spectrum.

5.2.9 Press "F1" to start acquisition.

5.2.10 Collect at least a two minute spectrum and press "F1" to stop acquisition.

5.2.11 Record the ADC, AMP, and HVPS settings in the Accuspec Log Book.

5.2.12 Adjust the AMP gain settings, if necessary, to align the Cs-137 662 KeV peak in the 662 channel and record any changes in the Accuspec Log Book.

5.2.13 Open the detector shield assembly, remove the Cs-137 source and place the 20 gram Uranium standard in the detector well and close the detector shield assembly.

5.2.14 Select "A" to open the acquire menu.

5.2.15 Select "P" to open the preset time menu.

5.2.16 Select "L" to open the preset live time menu.

5.2.17 Enter 16 minutes and 40 seconds, 1000 seconds, for the preset live time.

5.2.18 Press the "ESC" key until the main menu is reached.

5.2.19 Press "SHIFT-F2" to erase the current spectrum.

5.2.20 Press "F1" to start acquisition.

5.2.21 Upon completion of acquisition press "M" to open the move menu.

5.2.22 Select "D" to open the data menu

5.2.23 Press "ENTER" to use the default file to transfer the spectrum from.

5.2.24 Enter "F" to name the file to transfer the spectrum and press "enter".

5.2.25 Press "ENTER" to use the default Header.

5.2.26 Press "ENTER" to use the default Eff File.

5.2.27 Press the "ESC" key to return to the main menu..

5.2.28 Press "E" to exit the program.

5.2.29 Enter a "Y" to continue exiting.

5.2.30 When prompted to continue analysis enter a "Y" to perform NUTRANL analysis. The U-238 standard should yield approximately 127,200 counts in 1,000 sec of live time counting. The counter is being calibrated against all photopeaks in the spectrum over the energy range from approximately 50 to 2,000 keV.

5.2.31 The computer will display "U-238 IS DONE. PLEASE START THE TH-232 STANDARD. PRESS ANY KEY"

5.2.32 Press "ENTER" to continue.

5.2.33 Enter "YYMMDDC2" for the sample ID.

5.2.34 Enter "CALIB THORIUM" for the category.

5.2.35 Enter "THORIUM STANDARD" for the description.

5.2.36 Press the "ESC" key.

5.2.37 Open the detector shield assembly and place the 20 gram Thorium standard in the detector well and close the detector shield assembly.

5.2.38 Repeat steps 5.2.19 to 5.2.30. The Th-232 standard should yield approximately 1,070,600 counts in 1,000 sec of live time counting. The counter is being calibrated against all photopeaks in the spectrum over the energy range from approximately 50 to 2,000 keV.

5.2.39 The computer will display "TH-232 IS DONE. PLEASE START THE RA-226 STANDARD. PRESS ANY KEY"

5.2.40 Press "ENTER" to continue.

5.2.41 Enter "YYMMDDC3" for the sample ID.

5.2.42 Enter "CALIB RADIUM " for the category.

5.2.43 Enter "RADIUM STANDARD" for the description.

5.2.44 Press the "ESC" key.

5.2.45 Open the detector shield assembly and place the 20 gram Radium standard in the detector well and close the detector shield assembly.

5.2.46 Repeat steps 5.2.19 to 5.2.30. The Ra-226 standard should yield approximately 1,073,800 counts in 1,000 sec of live time counting. The counter is being calibrated against all photopeaks in the spectrum over the energy range from approximately 50 to 2,000 keV.

5.2.47 The computer will display "RA-226 IS DONE. PLEASE START THE K-40 STANDARD. PRESS ANY KEY".

5.2.48 Press "ENTER" to continue.

5.2.49 Enter "YYMMDDC4" for the sample ID.

5.2.50 Enter "CALIB K-40" for the category.

5.2.51 Enter "POTASSIUM STANDARD" for the description.

5.2.52 Press the "ESC" key.

5.2.53 Open the detector shield assembly and place the 20 gram Potassium standard in the detector well and close the detector shield assembly.

5.2.54 Repeat steps 5.2.19 to 5.2.30. The K-40 standard should yield approximately 14,521 counts in 1,000 sec of live time counting. The counter is being calibrated against all photopeaks in the spectrum over the energy range from approximately 50 to 2,000 keV.

5.2.55 The computer will display "K-40 IS DONE. PLEASE START THE BACKGROUND STANDARD. PRESS ANY KEY"

5.2.56 Press "ENTER" to continue.

5.2.57 Enter "YYMMDC5" for the sample ID.

5.2.58 Enter "CALIB BACKGROUND" for the category.

5.2.59 Enter "BLANK STANDARD" for the description.

5.2.60 Press the "ESC" key.

5.2.61 Open the detector shield assembly and place the 20 gram Blank standard in the detector well and close the detector shield assembly.

5.2.62 Repeat steps 5.2.19 to 5.2.30.

5.2.63 The computer will display "IS A NEW CALIBRATION DESIRED? "Y OR N".

5.2.64 Enter "Y" to install the calibration data into the data file.

5.2.65 The computer will display "CALIBRATION IS FINISHED. PRESS ANY KEY".

5.2.66 Press "ENTER" to continue.

5.2.67 Record the data and time of the calibration in the Accuspec Log Book.

5.3 Daily Background and Efficiency Checks

5.3.1 From the C:> prompt type "START" to start NUTRANL.

5.3.2 Press "ESC"

5.3.3 To Perform the Background Check:

A) Press "A" to open the Acquire Menu.
B) Press "P" to open the Preset Menu.
C) Press "L" to open the Live Time Menu.
D) Enter 3600 to set the live time to 1 hour (3600 seconds).
E) Press "ESC" until main menu is reached.
F) Place an empty vial in the detector assembly.
G) Press "SHIFT-F2" to erase current spectrum.
H) Press "F1" to start acquisition.
I) Upon completion of acquisition press "Pg Dn" until the marker/RDI Screen is Displayed.
J) Press "HOME" to set the curser at channel # 1.
K) Press "CTRL-L" to set the left marker at channel # 1.
L) Press "END" to set the cursor at channel #2045.
M) Press "CTRL-R" to set the right marker at channel #2048.
N) Copy the total CTS displayed onto the "Lab Instrument Check Sheet".

5.3.4 To perform the Efficiency Check:

A) Press "A" to open the Acquire Menu.
B) Press "P" to open the Preset Menu.
C) Press "L" to open the Live Time Menu.
D) Enter 60 to set the live time to I minute (60 seconds).
E) Open the shield assembly and place the check source in the detector and close the shield assembly.
F) Press "SHIFT-F2" to erase the current spectrum.
G) Press "F1" to start acquisition.
H) Upon Completion of Acquisition press "Pg Dn" until the markers/RDI Screen is displayed.
I) Using the arrow keys place the curser at the left start channel of the 88 Kev Peak and press "CRTL-L" to place the left marker.
J) Using the arrow keys place the curser at the right end channel of the 88 Kev Peak and press "CTR-R" to place the right marker.
K) Copy the net CTS displayed onto the "Lab Instrument Check Sheet".

5.3.5 Forward the "Lab Instrument Check Sheet" for input into the computer.

5.3.6 The computer tracks the background and efficiency check using a 30 Day average and will report when either is outside of ±2 standard deviation.

5.3.7 If the background and efficiency check meet the acceptance criteria, place the instrument in service.

5.3.8 If the efficiency check fails to meet the acceptance criteria then repeat step 5.3.4.

5.3.9 If the Accuspec fails a second efficiency check, place the instrument out of service and notify the Lab Supervisor.

5.3.10 If the data from the Blank Standard indicates a contaminated detector, place the instrument out of service and notify the Lab Supervisor.

5.4 Routine Sample Analysis

5.4.1 At the C:> prompt type "START" and press "ENTER" to start NUTRANL.

5:4.2 If the sources, U-238, Th-232, RA-226, K-40, and the blank, have been run for the day you may skip to step 5.4.54.

5.4.3 Enter " Source Count" for the category.

5.4.4 Enter "YYMMDXX" for the identification tag where YY = year, MM = month, DD = day.

5.4.5 Enter "Radium STD" for the description.

5.4.6 Enter "20" for the weight.

5.4.7 Enter "y" for the dry weight.

5.4.8 Press "ESC" to go to the MCA Screen.

5.4.9 Press "A" to open the Acquire Menu.

5.4.10 Press "P" to open the preset menu.

5.4.11 Press "L" to open the Live Time menu.

5.4.12 Press the "300" to set live time to 5 minutes (300 seconds).

5.4.13 Press "ESC" until the main menu is displayed-

5.4.14 Open the shield assembly, insert the EPA tailing or NBL-75 standard, and close the shield assembly.

5.4.15 Press "SHIFT-F2" to erase the current spectrum.

5.4.16 Press "F1" to start Acquisition.

5.4.17 Upon completion of Acquisition press "M" to select transfer data.

5.4.18 Press "D" to select data.

5.4.19 Press "ENTER" to select the default file to move data from, the default file.

5.4.20 Enter "F" to select the destination file..

5.4.21 Enter an "ENTER" to select the default header file.

5.4.22 Press "ENTER" to select the default efficiency file.

5.4.23 Press "ESC" to return to the main menu.

5.4.24 Press "E" to exit.

5.4.25 Enter "Y" to confirm the exit.

5.4.26 At the "Continue with Analysis (Y or N)" prompt enter "y" to perform NUTRANL Analysis.

5.4.27 Upon Completion of the analysis enter "CTRL-E" to exit.

5.4.28 Type "PRINTOUT" and press "ENTER" to print the result.

5.4.29 Collect the printout and review the RA-226 result

5.4.30 For the USEPA tailing standard, if the value is 309.6 pCi/g to 378.4 pCi/g, (±10% of 344 pCi/g) the result is acceptable. For the NBL-75 standard, if the value is 149.4 pCi/g to 182.6 pCi/g, (±10% of 166 pCi/g) the result is acceptable.

5.4.31 Type "START" and press "ENTER" to enter NUTRANL.

5.4.32 If the RA-226 result was not acceptable:

A) Press "ESC" to go to the MCA Screen.
B) Press "S" to open the Setup Menu.
C) Press "P" to open the AMP Menu.
D) Press "G" to open the Gain Menu.
E) Enter the Gain value determined from the Radium Analysis.

NOTE: Log the "As Found" ADC an AMP Settings in the "Accu-Spec Log Book prior to adjust the gain.

F) Press "ESC" to return to the main menu.
G) Repeat steps 5.4.15 to 5.4.30
H) Continue step 5.4.31 until RA-226 analysis is acceptable.
I) If unable to adjust gain to bring the RA-226 Value into the specifications of step 5.4-30 notify the lab supervisor and place the Accuspec out of service.

5.4.33 If the RA-226 result is acceptable enter "Thorium STD" for the Description.

5.4.34 Press "ESC" to go to the MCA Screen.

5.4.35 Open the shield assembly, place the EPA Dilute Monazite or DH-1 STD in the Detector, and close the shield assembly.

5.4.36 Repeat steps 5.4.15 to 5.4.28

5.4.37 Collect the printout and review the Th-232 result.

5.4.38 For the EPA Dilute Monazite standard, if the value is 135 pCi/g to 165 pCi/g, (±10% of 150 pCi/g) the result is acceptable. For the DH-1 standard, if the value is 102.6 pCi/g to 125.4 pCi/g, (±10% of 114 pCi/g) the result is acceptable.

5.4.39 Type "START" and Press "ENTER" to start NUTRANL.

5.4.40 If the Th-232 value was not acceptable:

A) Repeat Steps 5.4.32 A to 5.4.31 D
B) Enter the gain value determined from the Th-232 analysis.
C) Continue at step 5.4.14

5.4.41 If the Th-232 Value was acceptable enter "URANIUM STD" for the description.

5.4.42 Press "ESC" to go to the MCA Screen.

5.4.43 Open the shield assembly, place the EPA Pitchblende or DH-1 STD in the detector and close the shield assembly.

5.4.44 Repeat steps 5.4.15 to 5.4.28.

5.4.45 Collect the printout and review the U-238 result

5.4.46 For the EPA Pitchblende standard, if the value is 2457 pCi/g to 3003 pCi/g, (±10% of 2730 pCi/g) the result is acceptable. For the DH-1 standard, if the value is 529.2 pCi/g to 646.8 pCi/g, (±10% of 588 pCi/g) the result is acceptable.

5.4.47 If the U-238 result is not acceptable:

A) Repeat steps 5.4.31. A to 5.4.31 D
B) Enter the gain value determined from the U-238 analysis.
C) Continue at step 5.4.14

5.4.48 If the U-238 result is acceptable enter "Potassium STD" for the description.

5.4.49 Press "ESC" to go to the MCA Screen.

5.4.50 Open the shield assembly, place the Potassium STD in the detector, and close the shield assembly.

5.4.51 Repeat steps 5.4.15 to 5.4.26.

5.4.52 Enter "BLANK" for the description.

5.4.54 Press "ESC" to go to the MCA Screen.

5.4.55 Repeat steps 5.4.15 to 5.4.26

5.4.56 Enter a description to the type of sample i.e., Lot #x, off site soils, etc. for the category.

5.4.57 Enter a sample description i.e., Sample number.

5.4.58 Enter the sample weight.

5.4.59 Enter a "y" or "n" for dry weight.

5.4.60 Press "ESC" to go to the MCA Screen.

5.4.61 Repeat steps 5.4.9 to 5.4.11 to set count time.

5.4.62 Repeat steps 5.4.15 to 5.4.26.

5.4.63 Repeat steps 5.4.52 to 5.4.57 for each sample to be analysis.

5.4.64 Upon completion of sample analysis press "CTRL E" to exit.

5.4.65 Type "PRINTOUT" and press "ENTER" to printout .a sample report.

5.4.66 Submit the data printout (see example in Attachment #1) to the Lab Supervisor and H. P. Supervisor for review.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Records

6.1.1 Accuspec Log Book

6.12 Accuspec Sample Log Book

6.1.3 Data Printout

6.2 Reports

6.2.1 None

6.3 Notifications

6.3.1 None

6.4 Retention

6.4.1 All the records generated in performance of this procedure shall be retained for the duration of the project.

7.0 ATTACHMENTS

Attachment #1 Example - Analysis Results Printout

ATTACHMENT #1
(Example)

GAMMA-SPEC ANALYSIS RESULTS

Date Analyzed:06/15/95 Time Analyzed: 1:25 Category: Source Count Analyzed by_______
Sample ID: 950615XX Description: Radium Std

Activity is reported on AS RECEIVED basis

Weight grams	U-238 pCi/g	Th-232 pCi/g	Ra-226 pCi/g	K-40 pCi/g	Total Gamma * pCi/g
20.0	2.1 ± 22.2	-0.0 ± 5.8	1740.6 ± 12.9	-66.0 ± 112.2	1676.67 ± 115.2

• Sum of U-238, Th-232, Ra-226, and K-40. Negative values are not part of total gamma.

LAKESHORE EAST

STANDARD OPERATING PROCEDURE

Title: Operation of the Ludlum Model 2000 Alpha System

Document: SOP-372

Revision Number: 0

Date: June 19, 2002 Replaces: New

OPERATION OF THE LUDLUM MODEL 2000 ALPHA SYSTEM

1.0 SCOPE

1.1 Purpose

The Ludlum Model 2000 (LM 2000) Alpha System is utilized at the control line area or in the counting laboratory for measurement of gross alpha radioactivity of various types of samples. The system normally consists of an Ludlum Model 43-10 alpha scintillation detector coupled to an Ludlum Model 2000 Scaler. This procedure describes the steps for operating the system.

1.2 Applicability

The LM 2000 system is used primarily for measuring smear samples and radon/thoron working level air samples for gross alpha radioactivity. If necessary, it may be used for the measurement of gross alpha radioactivity of air particulate and water samples in the event that the Gamma Products Model G5000 Gas Proportional Counting System is not available.

2.0 REFERENCES

32 Illinois Administrative Code, Parts 310 and 340, Standards for Protection Against Radiation

32 Illinois Administrative Code, Part 400, Notices, Instructions and Reports to Workers; Inspections

State of Illinois Department of Nuclear Safety Radioactive Material License Number STA-583

Ludlum Technical Manual for Ludlum Model 43-10 Alpha Sample Counter.

Ludlum Technical Manual for Scaler Model LM 2000.

3.0 DEFINITIONS

None.

4.0 REQUIREMENTS

4.1 Prerequisites

None

4.2 Tools, Material, Equipment

4.2.1 Ludlum Model 43-10 Alpha Scintillation Detector

4.2.2 Ludlum Model LM 2000 Scaler

4.2.3 Appropriate calibration standard which is traceable to the National Institute of Standards and Technology (NIST):

a. Eberline electroplated Pu--39 standard (serial number S-4100) or equivalent

4.3 Precautions, Limits

4.3.1 Do not exceed 1500 volts using the H.V. ADJUST ten-turn potentiometer on the front panel of the mini scaler. Photomultiplier (PM) tube damage may result.

4.3.2 Considerable time may be lost waiting for the PM tube and crystal to dark adapt. Always keep the sample drawer in the closed position when not in use to avoid possible contamination.

4.3.3 Operate the LM 2000 only in the LINE Mode as indicated on the operating knob on the front panel. Batteries are not normally installed in the LM 2000.

4.3.4 Before counting any samples, ensure that the daily background and daily efficiency determinations have been performed.

4.3.3 Any adjustments to the high voltage, window threshold, window setting, scaler or detector change out requires a recalibration of the instrument.

4.3.4 In the event of a power failure, a background check and efficiency check is required prior to placing the instrument back in service.

4.4 Acceptance Criteria

4.4.1 The daily background determination passes if the number of counts lies between the ± 2 standard deviation range established by the background control chart.

4.4.2 The daily efficiency determination passes if the number of counts lies between the ± 2 standard deviation range established by the instrument control chart.

5.0 PROCEDURE

5.1 Initial Setup

5.1.1 Apply power to the instrument by turning the operating knob located on the front panel of the scaler to the LINE position.

5.1.2 With the sample drawer in the closed position, ensure that the high voltage is adjusted to the value determined by the most recent plateau curves. If necessary, adjust the high voltage using the H.V. ADJUST ten-turn potentiometer on the front panel of the scaler.

5.2 Plateau Curves

5.2.1 High voltage source and background plateau curves must be generated initially. If, for any reason, either the counting instrument, detector assembly or PM tube is changed, a set of new curves must be run.

5.2.2 On a VOLTAGE PLATEAU form (Attachment 2), record the instrument, observer, date, time, source serial number, and any other pertinent information.

5.2.3 Turn the high voltage to a minimum using the H.V. ADJUST ten-turn potentiometer on the front panel of the scaler.

5.2.4 Apply power to the instrument by turning the power knob located on the front panel of the scaler to the LINE position.

5.2.5 Set an appropriate count time (1 minute suggested) using the timer adjustment switches on the front panel of the scaler.

5.2.6 Place the Pu-239 check source in the sample tray and close the tray, locking it closed with the unlocking knob.

5.2.7 Adjust the ten-turn potentiometer in definitive increments (50 volts suggested), recording the counts and voltage on the "VOLTAGE PLATEAU" form.

NOTE:
Do not exceed 1500 volts. If 1500 volts are exceeded the photomultiplier tube may be damaged. If using the RD-14, do not exceed 1800 volts.

5.2.8 Plot the reading versus high voltage settings on a sheet of rectangular coordinate paper.

5.2.9 Remove the check source from the detector and close the sample drawer.

5.2.10 Repeat steps 5.2.7 and 5.2.8 without the source, for a background

5.2.11 Plot the results of the high voltage background plateau curve on the same plot as the high voltage source plateau curve.

5.2.12 From the graph, choose the high voltage setting which is on the flat portion of the curve with a minimum background count. Set the high voltage to this value.

5.3 Chi-square Test

5.3.1 A Chi-square test must be generated upon initial setup, equipment change out or repair, high voltage adjustment, and monthly.

5.3.2 Obtain the "COUNTER TEST-CHI-SQUARED" data sheet (Attachment 1).

5.3.3 Record:

a. Your name
b. The date
c. Time
d. The high voltage setting
e. The source used

5.3.4 Open the sample tray, place the Pu-239 source into the planchet, and close the sample tray.

5.3.5 Set the timer for 1 minute and depress the count button.

5.3.6 Upon completion of the count, record the results on the "COUNTER TEST-CHI-SQUARED DATA SHEET," Attachment 1.

5.3.7 Repeat steps 5.3.5 to 5.3.6 until 21 data points have been recorded. Remove the source from the detector. Record this data on Attachment 1.

5.3.8 When all the above data has been entered on Attachment 1, perform the calculations on Attachment 1.

5.3.9 Using the table on Attachment 1, find the value of "P" and record the value on Attachment 1. If the value of "P" falls between 0.98 and 0.10, the counter passes the test. If the value of "P" falls outside of these values, the counter fails the test.

5.3.10 If the counter fails the test, rerun the test. If the counter fails a second time, tag the detector out of service and notify the lab supervisor.

5.4 Background Determination

5.4.1 Perform a 50 minute instrument background check daily.

a. Verify that the LM 2000 is not in a count sequence by insuring that the "count" light is not lit.

b. Open the sample tray by operating the unlocking knob and sliding the tray out of the detector.

NOTE
The 43-10 is a scintillation detector and is light sensitive. Care must be used not to force or pull sideways when opening the sample tray.

c. Remove any sample that may have been left in the detector and clean the sample tray with a clean cloth.

d. Insert the Pu-239 alpha standard and shut the sample tray by gently sliding the tray into the detector and operating the unlocking knob.

e. Press the count button and verify that the count light is on indicating that the LM 2000 is in a counting sequence.

f. Counting is complete when the count light is extinguished.

5.4.2 Record the results of the background measurement onto the LM 2000 log and the daily LAB INSTRUMENT CHECK SHEET.

5.4.3 If the 2 sigma error from the daily background does not overlap the 2 sigma error of the previous 30 days background, then the sample tray should be decontaminated and the background should be recounted.

5.5 Efficiency Determination

5.5.1 Following the background measurement, perform an efficiency determination with the Pu-239 alpha standard designated for this purpose using a count time of 5 minutes. The efficiency determination must be performed daily, or if not used daily, prior to each use.

a. Verify that the LM 2000 is not in a count sequence by insuring that the "count" light is not lit.

b. Open the sample tray by operating the unlocking knob and sliding the tray out of the detector.

NOTE
The 43-10 is a scintillation detector and is light sensitive. Care must be used not to force or pull sideways when opening the sample tray.

c. Remove any sample that may have been left in the detector.

d. Shut the sample tray by gently sliding the tray into the detector and operating the unlocking knob.

e. Press the count button and verify that the count light is on, indicating that the LM 2000 is in a count sequence.

f. Counting is complete when the count light is extinguished.

5.5.2 Log the results of the efficiency determination onto the daily LAB INSTRUMENT CHECK SHEET:

5.5.3 The daily efficiency determination is acceptable if the number of counts lies between the ± 2 stand deviation range established by the instrument control chart.

5.5.4 If the instrument fails the daily efficiency determination the first time, it must subsequently pass two consecutive times before the instrument is considered acceptable for operation.

5.5.5 If the daily efficiency fails two consecutive times, the instrument is placed out of operation until the cause of the failures is investigated. The system is placed back into operation only after:

a. The cause of the failures has been identified and recorded in the instrument log.

b. Efficiencies have been verified or system recalibration has taken place.

5.6 Lower Limit of Detection (LLD) Determination

5.6.1 Use the equation shown on Attachment 3, the Smear Counting Data sheet, to determine the LLD.

5.6.2 Record the LLD on each SMEAR COUNTING DATA SHEET, or printout when available.

5.7 Routine Sample Analysis

5.7.1 Set the desired count time using the timer adjustment switches on the front panel of the mini scaler.

5.7.2 Using forceps, remove the smear or air particulate sample to be counted from the glassine envelope and load it into a sample planchet. For evaporated samples (i.e., liquids) proceed to the next step.

5.7.3 Open the sample drawer.

5.7.4 Position the sample planchet in the center of the sample drawer.

5.7.5 Slide the sample drawer to the fully closed position and lock closed by operating the unlocking knob.

5.7.6 Start the count by pressing the COUNT button on the front panel of the scaler.

5.7.7 At the conclusion of the count, open the sample drawer, remove the sample planchet, and return the sample drawer to the closed position.

5.7.8 Remove the sample from the planchet, return it to the glassine envelope, and store the sample in the designated location.

5.7.9 Attach the printout, if available, to the survey, recording the survey number, instrument background, efficiency, and lower limit of detection on the `printout. If no printout is available, record the counts accumulated on the scaler onto the SMEAR COUNTING DATA SHEET (Attachment 3).

5.8 INSTRUMENT OUT OF CALIBRATION

5.8.1 When an instrument is found to be "out of calibration" or fails a daily response check immediately notify the HP Supervisor.

5.8.2 The HP Supervisor shall determine the last date that the instrument passed a daily source response check, or the last calibration date, whichever is later.

5.8.3 Based on the last acceptable source response check or good calibration date, the HP Supervisor shall determine what radiological surveys were performed with the defective instrument.

5.8.4 The HP Supervisor shall determine whether regulatory or general information surveys were performed with the defective instrument.

5.8.5 Using previous surveys or previous knowledge of the survey data, the HP Supervisor shall determine whether the surveys taken with the defective meter are acceptable or the surveys must be re-performed. In the case of regulatory surveys the survey shall be retaken, if possible, if resurveying is not possible the HP Supervisor will make a written assessment of the quality of the data.

5.8.6 Source check failures/ "out of calibration" are to be recorded in the instrument log book and a nonconformance report (NCR) shall be initiated per QPM-DOC #9, in order to assess trends.

6.0 RECORDS/REPORTS/NOTIFICATIONS

6.1 Lab Instrument Check Sheet

6.1.1 The LAB INSTRUMENT CHECK SHEET is utilized to record the results of the daily background measurement and daily efficiency determination. The information from the sheet is entered into the Health Physics database.

6.2 Voltage Plateau Form

6.2.1 The VOLTAGE PLATEAU form is utilized to record the data used to generate the high voltage and background plateau curves.

6.3 Smear Counting Data Sheet

6.3.1 The Smear Counting Data sheet is utilized to record all pertinent data from smear counting where no printing device is available.

7.0 ATTACHMENTS

7.1 Attachment 1 Counter Test-Chi Squared
7.2 Attachment 2 Voltage Plateau Form
7.3 Attachment 3 Smear Counting Data Sheet

ATTACHMENT 1

COUNTER TEST - CHI -SQUARED (X^2)

OBSERVER	DATE	TIME	VOLTAGE SETTING	STANDARD
COUNT TIME - ONE MINUTE				

COUNT	NET COUNT	AVERAGE		
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
TOTAL OF 20			TOTAL	

P	X^2
0.98	8.5
0.95	10.1
0.90	11.6
0.80	13.7
0.50	18.4
0.20	23.8
0.10	27.3

IF P FALLS BETWEEN 0.98 AND 0.10 THE COUNTER IS FUNCTIONING PROPERLY

* Discard one unusually high or low count in calculating ñ.

$\ddagger\ \tilde{n}\ \frac{\sum n}{20} \bullet \frac{\quad}{20} =$ [ ] Enter this value in n column for each count number.

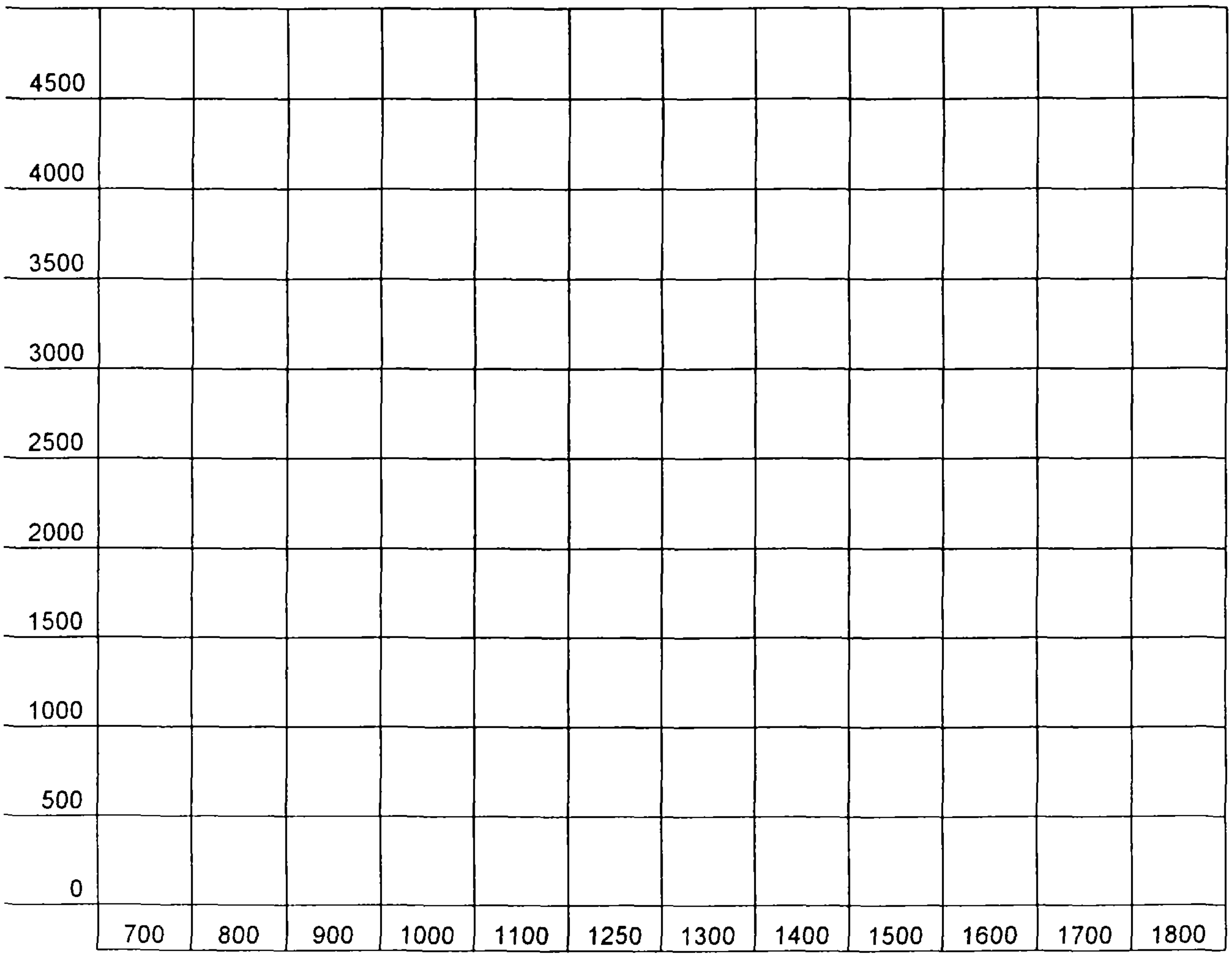
$X^2 = \frac{\sum(n-\tilde{n})2}{\tilde{n}} =$ [ ] . P = [ ] .

Standard Deviation for a 95% Confidence Level = (1.96) $\left(\sqrt{\frac{\sum(n-\tilde{n})2}{20}}\right)$

ATTACHMENT 2
VOLTAGE PLATEAU FORM
RD-14/LM-2000

Instrument Serial Number ___________ Source Serial Number_____________ Date ______________
Pulser Serial Number_______________ Scaler Model Number_____________ Serial Number ______
Technician Name________________________ Technician Signature _________________________

Counts per Minute



DETECTOR VOLTAGE

ATTACHMENT 3

SMEAR COUNTING DATA SHEET

TO BE USED WHEN NO PRINTOUT IS AVAILABLE

Instrument Number ______________________________ Background ____________
Efficiency ______________ LLD ______________ Date ____________
Survey Performed By ______________________________ Survey Number ____________

SMEAR NUMBER	GROSS COUNTS PER MINUTE	DPM/100CM^2		SMEAR NUMBER	GROSS COUNTS PER MINUTE	DPM/100CM^2

LLD Calculation:

$$LLD = \frac{2.71}{Ts} + 3.29\sqrt{\frac{Cb}{Tb} x \left[1 + \frac{(Tb)}{Ts}\right]}$$

Where
C_B = Background counts per minute
T_S = Sample count time in minutes
T_B = Background count time in minutes

Smear Activity Calculation:

$$A = \frac{(CcT) - B}{EFF}$$

Where
C_C = Gross counts
T = Count time in minutes
B = Background counts per minute
EFF = Efficiency

APPENDIX C

Plans

Dust Control Plan
Emergency Contingency Plan
Transportation and Logistics Plan
Verification Sampling Plan

LAKESHORE EAST

Title: Dust Control Plan

Revision Number: 0

Date: June 19, 2002

Replaces: New

DUST CONTROL PLAN

1.0 PURPOSE

The Dust Control Plan (Plan) describes methods STS and its contractors on behalf of Lakeshore East, will follow to conduct operations and maintain the work area within the subject site (Site) so as to minimize the creation and dispersion of dust. This Plan also contains corrective measures that will be used in the event visual dust is created, air monitoring shows excessive particulates, or air sampling indicates limits have been exceeded.

A primary concern during the excavation activities at the Site will be the generation of radioactive particulates from excavation and earth-moving equipment. Fugitive dust generation may be caused by a range of activities including excavation, loading, and transportation of excavated soils. Traffic on the Site also may cause resuspension of particulates.

Dust control measures will be used throughout the excavation and restoration activities at the site, especially during excavation, backfilling, and grading activities.

2.0 GUIDANCE

Dust control will be performed in accordance with the Removal Action Work Plan (Work Plan), the Health and Safety Plan (HASP), and the Air Monitoring Plan (Appendix 8 to the Work Plan). STS will perform site perimeter air monitoring in accordance with the Air Monitoring Plan.

3.0 IMPLEMENTATION

STS will be responsible for implementing dust control procedures as required in this Plan, the HASP, and the Air Monitoring Plan. The Field Team Leader will be responsible for ensuring compliance with the dust control procedures at the excavation site.

4.0 PRODUCTS

Water will be used in connection with mechanical dust suppression. Chemical foams, such as fire fighter foam, may also be used if approved by USEPA. If available, water will be obtained at the Site. If water cannot be obtained at the Site, temporary sources of water can be provided for construction activities from water trucks parked adjacent to the property or from portable plastic water tanks. Small (1,800 gallon) water trucks equipped with several hundred feet of hose and a pump can be used to spray water. Also, small pumps and hose can be used with the portable tanks to provide sufficient pressure and volume for dust control.

5.0 EXECUTION

Procedures to be followed to control dust may include traffic speed control, use of stockpiles, covering vehicles transporting borrow material and waste, and wind screens around excavation areas. These procedures will be utilized during excavation, restoration, transportation and associated materials handling activities.

5.1 Traffic Speeds

Traffic speeds will be maintained in accordance with applicable County, City, State and Federal regulations. The speed limit for traffic on the site will be posted by Lakeshore East or its representatives. In no case shall speed limits in excess of 15 miles per hour be posted.

5.2 Use of Stockpiles

Where possible, excavated contaminated materials will be loaded into the transport containers the same day they are excavated. Any radiologically-impacted material stored on-site will be either in containers or in Supersacks if there is not sufficient material to mobilize a container. Stockpiled clean material, including excavated and borrow material, will be piled to minimize dust generation. Further, slopes of stockpiled materials will be minimized in the prevailing wind direction. A 5:1 slope or flatter in the prevailing wind direction will be maintained whenever possible. Stockpiles will be constructed with their length perpendicular to the prevailing wind direction.

Stockpiled material will be covered during periods of high wind or when work on a stockpile is not actively occurring, such as the end of the work day. Stockpiles will be covered with a geomembrane cover to minimize dust generation during excavation and restoration activities. Approved geomembrane covers are Griffolyn TX 1200 manufactured by REEF Industries, Inc., and Sani-Cover SC #250 manufactured by Fluid Systems, Inc., or other equivalent.

5.3 Off-Site Transportation of Excavated Materials

Trucks used for transporting non-contaminated excavated or borrow material will be equipped with truck bed covers (tarps) to prevent the generation of dust from hauling. The tarps will be fastened down tightly to prevent materials from being blown out of the trucks. Empty trucks also will be tarped.

Roll-off containers for transporting low-level radioactive materials, will be lined with plastic or suitable leakproof liner and be equipped with full covers. The covers will be securely fastened to the containers before leaving the excavation area.

Trucks and other heavy equipment will be cleaned to remove mud, soil, and loose dust prior to leaving an excavation area. This cleaning will include the truck tires. Dirt that is tracked onto paved streets will be swept and added to stockpiles at the excavation area.

5.4 Use of Water as a Dust Suppressant

Water will be applied during the course of excavation and restoration activities as directed by the Field Team Leader to prevent, mitigate, or reduce dust resulting from excavation activities. Water will be applied when:

- wind or vehicular traffic may cause visible dust generation;
- exposed surfaces of material stockpiles are potentially dry and wind or handling activities may cause dust generation;
- dust generation is possible during excavation activities on the site;
- hauling of excavated or borrow material may cause visible dust generation in truck beds; or
- dust generation is possible during placement of materials in stockpiles or fill areas.

A water truck or pump and storage tank assembly will apply water to the exposed ground surfaces via hoses, pumps, nozzles and other appurtenances as required. The truck or pump/tank assembly also will apply water to control dust generation from exposed surfaces of material stockpiles, excavation activities, and hauling or excavation of borrow material.

Water will be applied in sufficient quantity to prevent generation of dust, but not so as to cause the movement of water beyond site boundaries, ponding, or the disruption of other project site areas. Because the soils will absorb the water, watering is not expected to generate runoff. The Field Team

Leader will monitor the excavation and restoration activities to make sure that enough water is used to adequately control dust, but that not too much water is used so as to create runoff.

5.5 Corrective Measures

If visual dust is created at a location during the excavation and restoration activities, or if air monitoring shows excessive particulates, the following corrective measures will be evaluated and applied as appropriate.

1. Increased wetting of surface areas.
2. Covering additional source areas.
3. Modifying future excavations and stockpiles to decrease the source areas.
4. Halting dust-creating activities until winds moderate.
5. Modify work activities.

If overwatering creates runoff into undisturbed areas, the water will be removed as practical, and the area radiologically surveyed. If radioactivity above the action level is found, the area will be cleaned by removing the contaminated materials, or by other appropriate means. Future occurrences will be prevented by more carefully controlling the amount of water applied by constructing earth berms around the area to retain the water, or by using a method of dust control other than water.

LAKESHORE EAST

Title: Emergency Contingency Plan

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

EMERGENCY CONTINGENCY PLAN

1.0 SCOPE OF PLAN

The purpose of the Emergency Contingency Plan (ECP) is to provide guidance and direction in the event of an unanticipated exposure of an individual to hazardous substances or hazardous conditions related to the excavation and restoration activities at the Lakeshore East site (Site).

Personnel assigned to this project will be required to review thoroughly the contents of this ECP and to strictly adhere to the policies and procedures provided herein.

2.0 EMERGENCY AND EVACUATION PLAN

2.1 Emergency Coordination

The Field Team Leader will coordinate emergency response at the Site. In the event of an emergency, the Field Team Leader will immediately notify the STS Project Manager. The STS Project Manager will be responsible for notifying the proper response agencies listed in Figure 1, Emergency Phone Numbers. Emergency response procedures, instructions for emergency response to injuries, and evacuation plans will be reviewed at safety briefings.

2.2 Emergency Services Contacts

Before field activities commence, the Field Team Leader will inform the appropriate emergency contacts about the nature and duration of work expected at the Site and the type of contaminants and possible health or safety effects or emergencies involving these contaminants.

All hospital treatment should be provided via the 911 Emergency Medical System, with the Chicago Fire Department providing ambulance service. Emergency services can be provided by Northwestern Memorial Hospital located within one-half mile of the Site. The location and possible route to the hospital from the Site, including narrative directions, are shown on Figure 2.

The emergency telephone numbers listed in Figure 1 will be distributed to the Field Team Leader. Emergency numbers will be reviewed every three months by the STS Project Manager and revised, as necessary. The STS Project Manager will date and sign new revisions. The Field Team Leader will record the date of the revised telephone number list in his daily log book. Upon revision, the figure will be submitted to the USEPA, and the City.

2.3 Implementation

The Field Team Leader will implement the emergency action procedures whenever conditions at the Site warrant such action. The Field Team Leader will be responsible for coordinating the evacuation, emergency treatment, and emergency transport of site personnel, as necessary, and informing the appropriate coordinating management staff. The following conditions may require implementation of emergency action procedures:

- Fire or explosion on-site.
- Serious personal injury.

Release of radioactivity exceeding one Annual Limit of Intake (ALI) as defined in 32 IAC 340.1220 in a 24-hour period.

Release of hazardous materials, including gases or vapors, at elevated levels.

- Unsafe working conditions, such as inclement weather (tornado, hail, etc.).

2.4 Fire or Explosion

If fire or explosion takes place, emergency steps shall include: 1) evacuation of work area; and 2) notification of local fire department and other appropriate emergency response groups listed on Figure 1, as necessary (e.g., if a spill occurs, the emergency spill hotline will be notified).

2.5 Personal Injury

Actions to be taken in the event of personal injury are described in the Health and Safety Plan, Section 4.3.4, Emergency Medical Treatment.

2.6 Evacuation Plan

All project personnel will evacuate the area under the direction of the Field Team Leader. Evacuation from the affected area will be initiated by sounding an alarm, such as an air-horn, megaphone, or other form of notification.

A coordinated evacuation will be conducted with all project personnel using the most direct upwind route, avoiding the point of emergency.

All project personnel involved in the evacuation will immediately move to the Decontamination/Transition area and will remain there awaiting further instructions from the Field Team Leader.

Personal Protective Equipment will be used at all times by the project personnel during the evacuation procedures.

2.7 Accident and Incident Reporting

All accidents, injuries, and incidents shall be reported to the Field Team Leader. An Accident/Injury Form will be completed by the Field Team Leader, as described in the HASP, Section 4.4, Accident and Incident Reporting.

FIGURE 1
EMERGENCY PHONE NUMBERS

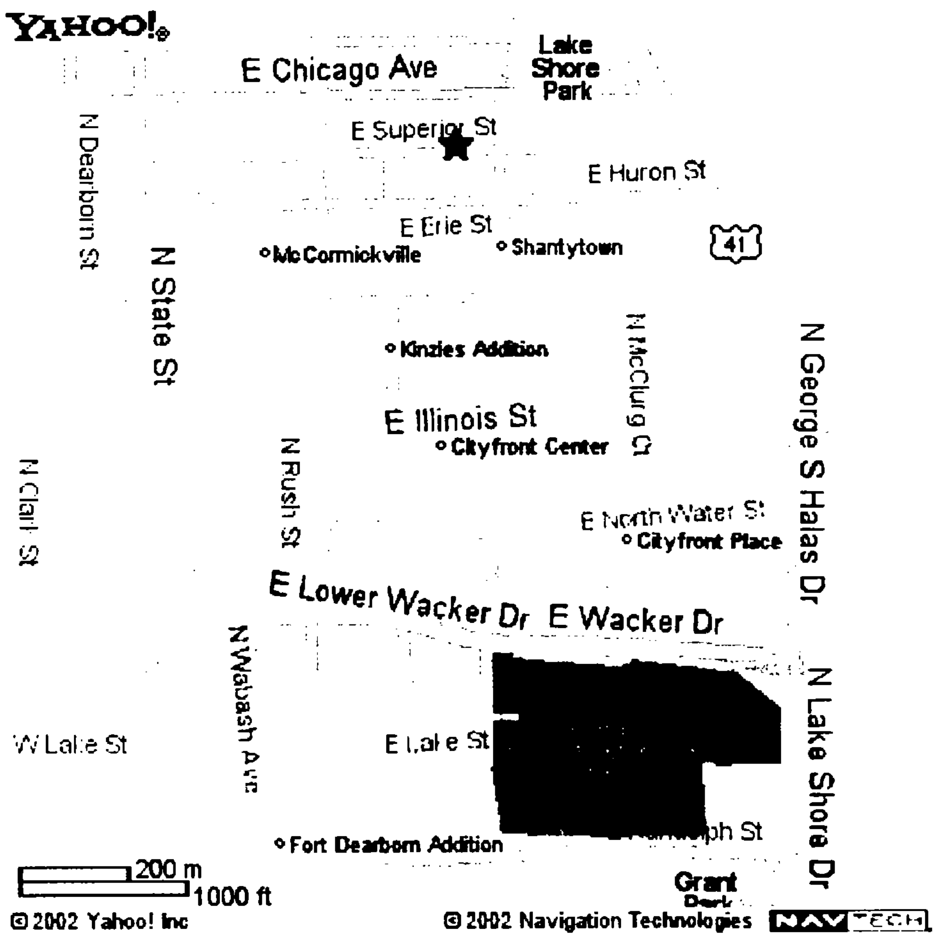
Police Department	911
Fire Department	911
Ambulance	911
Hospital Address Phone	Northwestern Memorial Hospital 250 E. Superior (312) 908-2000 (Ask for ER)
Poison Control Center	(800) 732-2200
USEPA Region 5 24-hours Emergency Number	(312) 353-2318
STS Project Coordinator Richard G. Berggreen	847-279-2500 (work) 847-417-7504 (mobile)
STS Project Manager Steven Kornder	847-279-2500 (work)
STS Field Team Leader Dumas Guerrier	847-344-6379 (mobile)

SECONDARY EMERGENCY NUMBERS

The STS Project Manager will evaluate when these agencies should be notified.

National Response Hotline	(800) 424-8802
Illinois Emergency Management Agency	(217) 782-7860
Illinois Environmental Protection Agency Emergency Response Duty Officer	(217) 782-7860 or (217) 782-3657, IEPA ERU during normal working hours.
Illinois Department of Nuclear Safety (IDNS) Emergency Number	(217) 785-0600 (24 hour Radiologic Assistance)

Hospital Location and Directions



Hospital:
Northwestern Memorial
250 E. Superior Street
Chicago, IL 60611

Directions from Lakeshore Links, 221 N. Columbus Drive

	Miles
1: Start out going North on N LOWER COLUMBUS DR towards N COLUMBUS DR by turning right.	0.12 miles
2: N LOWER COLUMBUS DR becomes N COLUMBUS DR.	0.27 miles
3: N COLUMBUS DR becomes N FAIRBANKS CT.	0.11 miles
4: Turn LEFT onto E ONTARIO ST.	0.12 miles
5: Turn RIGHT onto N ST CLAIR ST.	0.17 miles
6: Turn RIGHT onto E SUPERIOR ST.	0.08 miles

LAKESHORE EAST

Title: Transportation and Logistics Plan

Revision Number: 0

Date: June 19, 2002 Replaces: New

TRANSPORTATION AND LOGISTICS PLAN

Material exceeding 7.1 pCi/g will be directly loaded into intermodal containers for shipment via rail to the Envirocare of Utah low-level radioactive material waste disposal facility in Clive, Utah. Small quantities may be stored in Supersacks temporarily staged on-site until such time as adequate material is accumulated to fill a container. Empty containers will be prepared by installing a plastic liner inside the container. Empty containers will be staged and lined on Site. Containers will remain on their trailer chassises during their time on Site.

A jockey truck will be used on Site to bring the lined, empty containers to the excavation area. Every attempt will be made to keep the container and trailer on an existing asphalt surface at the edge of the excavation to minimize the potential for cross-contaminating the Site.

After the container is loaded with approximately 22.4 tons of material exceeding 7.1 pCi/g, the Health Physicist (HP) will survey the container, the container lid will be closed, and the container will be moved to the loaded container staging area. At the staging area, the lid of the container will be secured with chains or straps inherent to the container.

Preparing, loading and sealing containers will be performed in accordance with, the HASP, Attachment 3 to the Removal Action Work Plan.

Loaded containers with their shipping papers will be staged on Site. They will be transported to the railhead in Blue Island, IL at night, after evening rush hour traffic has abated. Shipping hours are anticipated to be between 8:00 p.m. and 3:00 a.m. Horns and back up alarms will not be used on Site between these hours to minimize disturbances to the local residents.

The intermodal transport crew will consist of a jockey driver with a yard tractor, one to two over-the road transport drivers, two laborers and an HP.

Transport drivers will deliver empty intermodal containers on chassises to the Site. At the Site, the two laborers will line the empty containers. The jockey driver will bring the lined empty container into position for loading. After loading, the HP will survey the container for release, and then the jockey driver will stage the container for shipping. Later that night, transport drivers will bring the loaded containers to the railyard for eventual shipping to Envirocare of Utah.

APPENDIX D

Specifications

Section 01010	Summary of Work
Section 01020	Construction Health and Safety
Section 02010	Demolition and Debris Removal
Section 02200	Contaminated Material Loadout and Earthwork
Section 02840	Site Utilities

LAKESHORE EAST

Title: Verification Sampling Plan

Revision Number: 0

Date: June 19, 2002 Replaces: New

VERIFICATION SAMPLING PLAN

1.0 INTRODUCTION

1.1 Purpose

This Verification Sampling Plan (Plan) describes the sampling activities and analytical methods that will be used to demonstrate the subject site meets the cleanup criteria. By following the protocol included in this plan, the USEPA will demonstrate the Site meets the cleanup criteria described in Section V.2.d of the Unilateral Administrative Order (UAO).

1.2 Scope

The verification survey will be conducted as excavation activities are completed at a Site. The purpose is to demonstrate the soils have been excavated to meet the cleanup criteria described in the UAO. Averaging over areas up to 100 square meters is allowed, but only after reasonable efforts have been made to achieve levels As Low As Reasonably Achievable (ALARA). (Reference SOP-223 "Verification Survey Procedure").

1.3 Contaminants of Concern

The verification program includes testing for specific constituents which are indicative of the contaminants of concern. Constituents of concern that may be encountered on the Site are the entire U-238 and Th-232 decay series; however, measurements will only be made for total radium (Ra-226 and Ra-228).

1.4 References

The following references have been used in developing this Plan:

- Administrative Order by Consent, USEPA, 1996;
- 32 IAC 332.150(b) - Soil Radioactivity and Exposure Rate Criteria;
- DOE Order 5480.11 and 10 CFR 20 - Surface Contamination and Exposures (ALARA); and
- NUREG/CR 5849 "Manual for Conducting Radiological Surveys in Support of License Termination" Draft June 92.

Standard Operating Procedures (SOPs) used during the verification sampling are included in the Standard Operating Procedures - Appendix B.

2.0 EXCAVATION CONTROL

2.1 Gamma Survey

A gamma survey will be done after the excavation is thought to be complete. The survey will comprise verification testing of the excavation.

Gamma measurements will be made over the entirety of the excavation. The procedure and instrumentation used will be 2 x 2 NaI detectors. This procedure provides a gamma measurement survey over an area of approximately one-square-meter. The gamma measurements will be collected over the entire area of the excavation to determine the concentration of radium remaining.

If the gamma survey indicates areas where the measured radium concentration exceeds the cleanup criteria of 5 pCi/g radium (Ra-226 and Ra-228) above background, additional material will be removed until the measured radium concentration is less than 5 pCi/g above background. Exceptions may be made to this operational criterion with USEPA concurrence.

In addition to the gamma survey, STS will obtain samples for laboratory testing to measure the total radium concentration of soils. Such testing may be used to resolve ambiguous gamma survey measurements, to establish or verify gamma/radium correlations, or to provide additional data to verify that the cleanup criteria have been met at the excavation. At least one composite soil sample will be taken for laboratory analysis from each excavation. The samples will be taken in accordance with the soil sampling procedure in SOP-214, and tested for radium (Ra-226 and Ra-228). Apparently clean material below the radiologically-impacted soil may be excavated to facilitate verification. This material will require sampling as overburden if it is to be managed as clean soil for backfill.

2.1.1 Gamma Survey Procedure

The gamma survey will be performed according to the Gamma Survey Standard Operating Procedure (SOP-210).

2.1.2 Documentation

The Verification Gamma Survey drawing described above will be used to document the readings obtained during the gamma survey. The drawing also will contain information pertaining to background gamma radiation levels and instrument calibration.

2.1.3 Quality Control

The gamma survey will be performed by trained individuals who have sufficient skill to obtain accurate and consistent information. All information obtained during gamma surveys will be reviewed by the Field Team Leader for accuracy and consistency.

All field equipment will be calibrated either in accordance with NUREG/CR 5849 "Manual for Conducting Radiological Surveys in Support of License Termination" Draft June 1992 or with industry-recognized protocols. Instrument response background and check source tests will be performed and recorded daily to ensure instrument operations are within the established acceptable range.

At least 5 percent of the survey area will be resurveyed. Readings from the initial survey will be compared to those readings obtained during the quality control (QC) survey to identify instrument malfunctions or reading/document errors.

3.0 DECONTAMINATION

All discarded materials, waste materials, and otter field equipment and supplies shall be handled in such a way to prevent the potential spread of contamination during excavation and restoration activities. Discarded items that have contacted contaminated materials will be containerized and stored for disposal at the approved disposal facility. Non-contaminated items to be discarded will be collected for disposal as non-hazardous waste. Personnel and sampling equipment decontamination are described in the Decontamination Procedure included as SOP 347 of Appendix B.

LAKESHORE EAST

Title: Summary of Work

Section 01010

Revision Number: 1

Date: September 30, 2002

Replaces: June 19, 2002

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 Description of the Project

This project directed by the United States Environmental Protection Agency Region 5 (USEPA) is at a location designated by the USEPA as related to the Lindsay Light II Site (Site) in Chicago, Illinois. The work covered by these specifications includes the following.

A. Site Description

Radioactive materials in concentrations above background have been found on the Site within the City of Chicago. The presumptive source of these materials is the Lindsay Light Company in Chicago. The identified "Site" is a portion of the former Illinois Central Railyards, currently developed as a golf course and driving range.

The Site is defined, for the purposes of the excavation and restoration action and according to the UAO, as the area with soil 5 picocuries per gram (pCi/g) total radium above background within the property at the southwest corner of Wacker Drive and Lake Shore Drive, within an address of 221 North Columbus Drive, Chicago, Illinois. Final definition of the limits of soil excavation and restoration will be the responsibility of the Respondents and their consultants and contractors.

B. Project Description

1. Work for the cleanup of the Site will be excavation and removal of impacted soil.

2. Site preparation includes all of the work which must be done before any excavation and restoration can begin. Some of the work, such as determining background air quality and background radiation, will be common to the entire Site. Other work, such as verifying the extent of contamination and documenting existing physical conditions, will be area-specific.

   a. Access Agreements. Discussions with the property owner and tenant concerning access will begin promptly upon notice from the USEPA. Once the initial access agreement is signed, the work described below will begin. Every effort will be made to keep the property owner and the USEPA informed of any changes to the work and to the schedule.

   b. Permits. Under Superfund, the site developer, Lakeshore East, LLC, is exempt from obtaining permits from the City of Chicago and Cook County for the excavation work conducted on-site, but must obtain permits for portions of the work accomplished off-site. Some permits, particularly those issued by the Department of Transportation to commercial carriers to transport the excavated soils and debris over public streets, will not be sought and, therefore, are not addressed in this Plan. Lakeshore East, LLC will contract only with transportation companies qualified and licensed to carry such materials. A list of the expected permits is included in Appendix C of the Work Plan, Permitting and Access Plan.

   c. Background Air Monitoring. Monitoring and analyses to be conducted prior to beginning excavation at the Site will provide adequate data to determine a background air quality which can be used for the Site. A description of the air monitoring that will be done is included in the Air Monitoring Plan for the Site including the proposed location for the background sample.

d. Site Survey. Prior to work at the Site, a current site survey will be prepared by a licensed surveyor.

e. Soil Sampling. Soil sampling is described in the Soil Sampling Plan (SOP-214). Background gamma values are developed in accordance with Gamma Radiological Surveys (SOP-210).

f. Utilities. For the Site, "utilities" will include, but not be limited to, natural gas, drinking water, waste water, communications, electrical power distribution, and storm water collection systems. The locations of all utilities will be determined, field located and shown on all maps and drawings for the properties. All work to replace, repair or backfill utilities shall be done as required by the appropriate utility company or agency.

g. Buildings. No buildings are present within the areas proposed to be excavated.

3. Excavation and restoration work includes removing any structures, facilities, landscaping or other appurtenances as necessary, excavating contaminated soils, cleaning contaminated buildings, facilities, structures, utilities and appurtenances, verifying that radioactivity greater than the cleanup criteria has been removed and backfilling all excavations. Site restoration is not proposed pending site development and construction.

   a. Work to remove asphalt paving, sidewalks, foundations, retaining walls, etc., is described in Section 02010 of these Specifications.

   b. Work to excavate contaminated soils is described in Section 02200 of these Specifications and in the Health and Safety Plan (HASP) for the Site.

   c. The requirements for soil sampling are described in the Soil Sampling Plan.

   d. The work for properly backfilling all excavations is included in the Work Plan.

1.2 Related Work

Other Division 1 Sections of these Specifications.

1.3 Definitions

A. Access Agreement refers to a legal document between the Contractor, Property Owner and tenant authorizing the Contractor or the USEPA to complete the excavation and restoration action as described in these Specifications, the Work Plan and the HASP.

B. City refers to the City of Chicago and its representatives.

C. Contract Documents for the work consist of the drawings, these specifications and all addenda issued prior to and all modifications issued after the execution of the contract.

D. Contractor refers to STS Consultants, Ltd. (STS) and its subcontractors and consultants.

E. County refers to Cook County, Illinois and its authorized representatives.

F. USEPA refers to the Region 5 office of the United States Environmental Protection Agency and its representatives.

G. Job Set refers to a complete set of Project Record Documents used during construction activities.

H. Project refers to all activities associated with the excavation and restoration action.

I. State refers to the State of Illinois and its authorized representatives.

J. Utilities. For the project, "utilities" will include, but not be limited to, natural gas, drinking water, waste water, communications, and electrical power distribution and storm water collection systems.

K. Work Order refers to the plans, drawings, additional specifications, directions and agreements prepared for properly completing work at the Site.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 Scope of Work

A. The work to be performed includes furnishing all labor, tools, equipment, materials, transportation, services, and incidentals, and performing all operations necessary for the excavation and transportation of radiologically-impacted soils, and the monitoring of those excavations as shown and noted on the drawings and as required in these Specifications.

B. The work includes the decontamination of the Site and the management of excavation and demolition materials in accordance with the Statement of Work. The work included is further described in Article 3.2, Construction Sequence.

3.2 Construction Sequence

Except as specifically noted, the construction sequence described below is intended as guidance for this project. At the discretion of the Contractor, the work may be done simultaneously or in an order other than below, as long as it will not affect the quality, timely completion, or safety of the work.

B. Mobilization

1. Mobilize personnel, equipment, materials, and temporary facilities needed for the project. Provide for electrical, water, communications and other utilities as required for the work.
2. Provide site-specific training for workers. Discuss work with crews, including areas of special concern (construction and radiological), construction schedule and sequence, and health and safety.
3. Prepare the personnel and equipment decontamination facilities.
4. Select areas within the Site for staging soils, containers and demolition materials. Prepare areas as necessary (e.g., berms for temporary water control, or plastic sheeting if on "clean" area)
5. Set up the air monitoring system and begin monitoring.
6. Set up traffic controls, as required.

C. Contamination Excavation

1. Excavation of contaminated buildings is not anticipated.

2. Excavation of contaminated soil will occur using these steps:

   a. Do construction staking or marking (additional surveying, as necessary, for horizontal and vertical limits of soil excavation). These limits will be based on the previous STS site investigation reports.

   b. As necessary, lock-out, tag-out, and/or shut down all utilities which could affect or be affected by the work. Purge, decontaminate and otherwise properly manage utilities so they can be removed, protected from damage, or relocated, as necessary.

   c. Excavate the contaminated soils on the property and transport them to the disposal facility. Stockpile soils on the Site only as necessary.

   d. Do soil sampling and gamma surveying to determine if additional excavation is necessary. Excavation will not extend below groundwater.

      (i) If necessary, do construction staking. Continue excavating until surveying and sampling indicate all contaminated materials have been removed.

      (ii) Notify the USEPA that pre-verification sampling has been completed and request verification surveying and sampling, and if found to meet the closure standard, request approval to backfill.

D. Restoration

1. Restoration is not proposed for the Site. Minimal restoration may consist of flattening the slopes of the excavations. The Site will be regraded in preparation for construction and development.

3.3 Disruption

A. The contractor will, to the extent practical, use his best efforts to undertake the project in a manner that avoids unnecessary disruption of local businesses and their customers or tenants.

3.4 Work Quality Control

A. Shop and field work shall be performed by personnel thoroughly trained and experienced in their field of expertise. Work on this project shall be performed in accordance with the best practices of the various trades involved.

B. Quality control inspections will be conducted for all construction activities under these specifications. The inspector will be independent of the work activity being inspected.

C. Work will be certified as having been completed in full satisfaction of these Specifications.

D. Work will be done as required by these Specifications, the Work Plan and other documents referenced in these Specifications.

LAKESHORE EAST

Title: Construction Health and Safety

Section 01020

Revision Number: 0

Date: June 19, 2002 Replaces: New

SECTION 01020

CONSTRUCTION HEALTH AND SAFETY

PART 1 - GENERAL

1.1 Scope

A formal Health and Safety Plan (HASP) has been prepared for the work described in these Specifications. This section of the Specifications summarizes the requirements of the HASP as they apply to the construction work, and references those sections of the HASP where detailed descriptions of the health and safety requirements and procedures can be found.

1.2 Related Work

A. Division 1 Section of these Specifications.

B. Section 02010 - Demolition and Debris Removal

C. Section 02200 – Contaminated Material Loadout and Earthwork

D. Section 02840 - Site Utilities

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 Safeguards will be taken to ensure the safety of workers in and around excavations. These will include, but not be limited to, the following:

a. Stairways, ladders, ramps, or other safe means of egress will be located in trench excavations that are 4 feet or more in depth.

b. No persons will be permitted underneath loads handled by lifting or digging equipment. Personnel are required to stand away from any vehicles being loaded or unloaded to avoid being struck by any spillage or falling materials.

c. All trenches and excavations 6 inches or deeper will be marked and guarded for the duration of the project with barricades placed a minimum of 2 feet from the edge of the excavation to prevent persons from falling into the opening.

d. Emergency rescue equipment such as breathing apparatus, a safety harness and line, etc., will be readily available in the project trailer.

e. Precautions will be taken to prevent surface or runoff water from entering the excavation. Ditches, dikes, or other effective means will be installed or used to prevent water from entering the excavation and to drain the surrounding areas.

f. Any excavation that meets the definition of a confined space will be treated as such, as defined by OSHA 1910.146, and all applicable procedures detailed in Section 13 of the HASP will be followed. A crawl space or storm cellar area could fall within the definition of a confined space if it: (1) is large enough and so configured that personnel can bodily enter and perform assigned work; and (2) has limited or restricted means for entry or exit; and (3) is not designed for continuous personnel occupancy.

g. All personnel in an excavation greater than four feet in depth will be protected from cave-ins by an adequate protective system. An adequate protective system will include barrier protection (e.g., shoring or trench boxes) or sloping. Other protective measures required by 29 CFR 1926, Subpart P also will be provided.

h. The determination of the angle of repose and design of any supporting system will be based on careful evaluation of pertinent factors such as depth of cut; possible variation in water content of material while the excavation is open; anticipated changes in materials from exposure to air, sun, water, or freezing; loading imposed by structures, equipment, overlying material, or stored material; and vibration from equipment, blasting, traffic, or other sources.

i. Daily inspections of excavations, the adjacent areas, and protective systems will be made and documented by a competent person. The documentation will include indications of potential cave-ins, failure of protective systems, hazardous atmospheres, or other conditions.

j. No employee or any other person will work adjacent to or enter an excavation until the work area has been inspected by the competent person. The inspection will determine if conditions exist which may expose workers to moving ground or any other unsafe conditions. Any deficiencies identified during inspections will be adequately corrected prior to work in excavation.

3.2 Training

1. All persons active in the excavation work at the Site will receive training as specified in Section 5 of the HASP for work with low-level radioactive materials. The training program in Section 5 of the HASP is in accordance with 29 CFR 1910.

2. In addition to the training above, periodic "tailgate" health and safety meetings will be held. The purpose of these meetings will be to discuss deficiencies in health and safety practices, discuss hazards specific to new properties or encountered at existing properties, discuss the results of monitoring, and generally reinforce good health and safety practices. A typical form for such meetings is found in Section 5 of the HASP.

3. Special training shall be provided or required for work such as the following.

   a. Supervisory Work. All supervisors shall have received at least the additional eight hours training required by OSHA.

   b. Truck Driver. All truck drivers shall be instructed in and knowledgeable about the routes to be used between the property and the train station, the requirements of the work (work with and transport of potentially radioactive materials), and the emergency and contingency procedures to be implemented in the event of an accident.

   All persons employed in the transport and handling of radioactive materials shall have received HAZMAT training.

      d. A competent person will be on- site for shoring.

3.3. Personal Protective Equipment (PPE) - Based on information obtained from monitoring observation of similar work at vicinity properties, work at this Site can be done in Level D PPE. The Health and Safety Coordinator will evaluate individual tasks and work areas and specify particular types of PPE based on this evaluation. PPE utilized in the performance of the work under these specifications will be in accordance with Sections 7 and 8 of the HASP.

3.4 Hot Work

A. Flame welding and cutting operations

1. Gas bottles shall be properly color-coded, in good condition, and stored in a secured manner in racks or carts. Bottles with corroded or damaged threads will not be used.

2. Regulators shall be in good condition, and suitable for the use.

3. Fuel gas and oxygen hose shall be easily distinguishable and shall not be interchangeable. Hoses shall be inspected at the beginning of each shift and shall be repaired or replaced if defective.

3.5 Transporting Contaminated Materials Over Uncontaminated Areas

A. Transport between the Site and the Rail Terminal

1. Haul routes between the Site and the rail terminal will be defined (see Traffic Control Plans in Appendix D of the Work Plan), and all operators will be instructed in the location and use of these routes. Transport of contaminated materials will be over designated routes only.

2. Rolloff containers used to transport contaminated materials over uncontaminated areas will be capable of transporting the material without spillage. Covers will be secured onto the containers prior to exiting the contaminated area. Empty trucks returning to the site will be tarped, as will trucks supplying clean backfill, topsoil, and related construction materials. Tarps will be fastened down tightly to prevent material from being blown out of the trucks.

3. Trucks and rolloff containers used to transport contaminated materials will be frisked and decontaminated if necessary in accordance with Subpart 3.8, below, prior to exiting the contaminated area.

4. Should a truck hauling contaminated material from the Site to the rail terminal accidentally spill any part of its load, the Contractor will direct site workers to assist in the cleanup. Spill cleanup, including proper notification of agencies and authorities, will be accomplished in accordance with the Emergency Contingency Plan.

B. Transport within a Property

1. Haulage routes will be established within the Site and all workers will be instructed in the location and use of these routes. Following excavation and restoration of soils and other materials, such routes will be examined, visually and with radiation detection equipment, for the presence of spilled materials. All spilled materials will be removed.

2. Practices to control spillage will be implemented during excavation and restoration. These practices will include such things as the following:

a. Not filling haul equipment above the sides of the bed or bucket,

b. Limiting travel speed, and

c. Covering haul routes with clean soil or other materials. Such materials would be inspected as above, and decontaminated for reuse or properly transported to the rail terminal for eventual transfer to the approved disposal facility.

3.6 Equipment Decontamination Facilities

A. Equipment Decontamination Station - An equipment decontamination station will be readily available for the decontamination of vehicles, tools, and equipment, prior to exiting the controlled area. The equipment decontamination station will be located within the secured area, and will include the following:

1. A steam pressure washer for removing contamination from the wheels, tracks, and other surfaces of the equipment and trucks.

B. Release of Construction Vehicles and Equipment for Unrestricted Use - Prior to being released from the Exclusion Zone, all construction vehicles and equipment will be frisked, and decontaminated if necessary. Contaminated vehicles and equipment will be decontaminated using a pressurized water spray in accordance with Subpart A, above. Water generated during the decontamination activities will be evaporated, infiltrated within the Exclusion Zone, used for dust control, or collected and stored on the Site for other purposes or eventual disposal.

3.7 Dust and Water Runoff Control

A. Dust control measures used during work activities on the Site may include, but are not limited to the following:

1. Using hoses with mist or fog nozzles to spray light applications of water over the areas of excavation or demolition, staging, loadout, and dumping/storage. The Contractor will be responsible for the control of excess water.

2. Minimizing travel over soil areas. Some travel over contaminated soils (e.g., by excavation equipment and by haul trucks) may be necessary. Dust minimization procedures will include, but not be limited to, the following.

a. Within the property, the speed limit for trucks and excavation equipment will be fifteen miles per hour.

b. Areas which will be used extensively as travelways (e.g., entrances to and exits from equipment decontamination facilities) will be sprayed with water as necessary to control dust.

3. Storage and staging piles will be covered when not in use.

B. Runoff water control measures on the Site may include, but are not limited to the following:

1. Excavation of temporary swales, ditches, and/or retention ponds.

2. Construction of temporary diversion dikes and berms.

3. Pumping of water to runoff water control facilities. Water removed from contaminated excavations will be evaporated, used for dust control, or collected and stored on the Site.

3.8 Contingency Plans and Emergency Response Procedures

Contingency plans and emergency response procedures for Site activities are provided in the Emergency and Contingency Plan. These plans and procedures will be followed in the event of an emergency situation arising from the work activities or acts of God that may affect the environment or human health and safety.

LAKESHORE EAST

Title: Demolition and Debris Removal

Section 02010

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

SECTION 02010

DEMOLITION AND DEBRIS REMOVAL

1.0 GENERAL

1.1 Scope

A. This section describes excavation requirements for existing Site features, including:

1. Salvage Disposition, Storage, and Handling of Property.
2. Demolition of Existing Site Features.
3. Sawcutting.
4. Debris Segregation, Decontamination, Haulage, Storage, and Disposal.
5. Matching and Patch Repairing.

B. Descriptions for radiological surveying are specified in the Work Plan, Appendix B (Verification Sampling Plan)

1.2 Related Work

A. Division 1 Sections of these Specifications.

B. Section 02840 - Site Utilities

1.3 Salvage Disposition. Storage and Handling of Property

A. Remove all structures, equipment, facilities, materials and other items called for in the Work Plan or that otherwise must be removed to access the work areas and store as directed. Such items shall be removed completely, including appurtenances, and shall be properly protected.

B. All non-radiologically-impacted materials, equipment, and other items permanently removed from the work area for the proper completion of the excavation work shall be properly managed and/or disposed as applicable.

1.4 Submittals

A. All submittals shall be made to the STS Project Manager.

B. Submit landfill tickets for all uncontaminated debris disposed offsite, no more than five days after disposal, except where dumpsters are emptied directly into collection trucks. The use of dumpsters will be recorded in the field logbook. Each ticket shall contain at least the information below.

1. Date of disposal.
2. Estimated volume or weight of load if required by the designated measurement method of the landfill.
3. Description of materials disposed.
4. Name of wastehauling subcontractor.

1.5 Health and Safety Conditions of the Work

In addition to the hazards common to demolition, radioactive materials are known to be present at this Site, and may be present in or on slabs/paving, structures, facilities and utilities.

A. Detailed health and safety requirements for work on the vicinity properties are included in Section 01020 of these Specifications and the HASP.

B. All demolition work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

C. Based on existing information, excavation work can proceed under Level D personal protection conditions (see HASP). Air and soil monitoring and sampling will be done during the conduct of the work to determine if modifications to Level D work conditions are necessary.

   1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by the STS Project Manager, STS Field Team Leader, or their Agent.

   2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal, equipment and vehicle decontamination) with minimal delay. Additional requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing hazardous materials or levels of radiation above background are encountered are discussed in Section 01020 of these Specifications.

D. The Quality Assurance Supervisor, Field Team Leader, or Health and Safety Coordinator may bar from the Site any person or persons who shows a disregard for health and safety of themselves or others.

1.6 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to the Project Quality Assurance Supervisor prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

Part 2 - Products

Not used.

Part 3 - Execution

3.1 General

A. The work performed under these Specifications shall be done as indicated in this Work Plan, specified herein, and as required by the permits and the laws, rules and regulations of the City of Chicago, the State of Illinois and the USEPA.

B. The Contractor shall remove existing property features as indicated in the Work Plan and shall perform demolition in a manner to allow segregation and proper disposal of contaminated and uncontaminated material. The Contractor must use methods and operations which will minimize the potential for the spread of contamination.

C. It shall be the Contractor's responsibility:

1. To maintain adequate safety measures and working conditions (see Section 01020 of these Specifications and the HASP).

2. To take all measures necessary during the performance of the work to protect the entire project area and adjacent properties which would be affected by this work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the STS Project Manager, STS Field Team Leader, or their Agent.

3. To maintain completed areas until the entire project area is in satisfactory compliance with the Specifications.

3.2 Structure Demolition

A. General

No structures are present on the site, where excavation is proposed.

B. Foundations

1. The methods used to demolish and remove foundations shall be at the discretion of the Contractor, as long as the requirements of these Specifications, the permits, and the laws, rules and regulations of the City, County, State, OSHA or the USEPA, whichever are more stringent, are met.

2. All demolition of foundations shall be done in a manner to minimize disturbance of the surrounding and underlying soil. This could include, but not be limited to, pre-breaking or sawing the foundation elements, and the measures described in Article 3.3 of these Specifications.

3. Concrete, rock or block foundations may be demolished and reduced in size as described in the foregoing subpart.

4. Foundation walls which serve as retaining walls to support earth or adjoining structures shall not be demolished until such earth has been properly braced, or adjoining structures have been underpinned to prevent movement. Bracing and shoring shall be evaluated and, if necessary, designed by a qualified Professional Engineer.

5. Adjacent foundation walls and "party" walls to a basement, which are to serve as retaining walls against which fill or debris will be placed, shall be checked for structural strength before they are to be so used. Evaluations and, if necessary, designs of shoring and bracing shall be done by a qualified Professional Engineer.

6. Foundations and basement floor slabs will be removed to verify conditions beneath them. The concrete, if not contaminated, will be staged on-site for later removal or will be removed as clean debris. Concrete found to be impacted will be decontaminated in accordance with SOP-345. If decontamination cannot be reasonably completed, the concrete will be reduced in size sufficient to be managed as impacted and loaded for off-site shipment and disposal.

C. Retaining Walls

1. The methods used to demolish and remove retaining walls shall be at the discretion of the Contractor, as long as the requirements of these Specifications, the permits, and the laws, rules and regulations of the City, County, State, OSHA or the U.S. EPA, whichever are more stringent, are met.

2. All demolition of retaining walls shall be done in a manner to minimize disturbance of the surrounding and underlying soil. This could include, but not be limited to, pre-breaking or sawing the pavement and slabs, and the measures described in Article 3.3 of these Specifications.

3. Shoring or bracing may be necessary during the demolition of retaining walls. Shoring or bracing shall be designed by a qualified Professional Engineer, competent in soils. Shoring and bracing designs shall be submitted to the Respondents or their Agent and the Field Team Leader prior to beginning excavation where their use may be necessary.

4. Concrete, rock or block foundations may be demolished and reduced in size as described in the foregoing subpart.

3.3 Sawcutting

A. The Contractor shall be responsible for all sawcutting necessary for the excavation of contamination whether described in the Work Plan or not. The Contractor shall sawcut concrete, masonry, asphalt paving, and other work as needed, observing the following requirements:

1. The Contractor shall provide liquid or other dust control for all sawcutting of contaminated materials or materials overlying contaminated materials.

2. Finished vertical concrete or masonry cuts shall be made using a track-mounted concrete saw. The finished cut shall be a minimum of three inches deep, in a straight and true line.

3. Finished horizontal concrete or masonry cuts shall be made using a cradle-mounted concrete saw. Make the finished cut a minimum of three inches deep, in a straight and true line.

4. Where portions of masonry will be removed and replaced, masonry excavation and restoration shall be along mortar joints so the finished wall will have the same masonry pattern as the existing.

5. Finished asphalt paving cuts shall be made using an asphalt blade in a cradle-mounted saw. The finished cut shall be a minimum of two inches deep, in a straight and true line.

6. If a clean break cannot be made where new concrete will be replaced against old concrete, provide sawcutting necessary to produce clean edges on the existing concrete.

3.4 Decontamination of Items

A. Some contaminated items such as slabs, pavement, and piping, can be decontaminated and disposed in industrial or other landfills. Decontamination of items will include removing the contaminated dust, dirt or encrustations from the surfaces of the items. Decontamination may be accomplished by high-pressure spraying, or manually removing contaminated materials with brushes, soap and water, rags, and miscellaneous hand tools until the items are verified as radiologically suitable for the proposed disposal.

B. Decontamination of contaminated equipment, tools, materials and supplies is described in detail in Section 01020 of these Specifications.

3.5 Contaminated Material Loadout and Transport

A. General Requirements

1. Before beginning contaminated material loadout operations, the Contractor shall construct temporary site drainage facilities and initiate dust control measures. The Contractor also shall construct all decontamination and loadout facilities and establish survey controls.

2. The Contractor shall use equipment and methods that minimize the potential for spillage of materials during loading operations.

3. At a minimum, the loadout shall be cleaned (liquid and nonliquid wastes removed) at the end of every other day. Spilled materials shall be promptly removed from the loading facility if the quantity is such that the material could be picked up and transported out of the loadout facility.

4. All decontamination of equipment shall be done as required herein and by Section 01020 of the Specifications.

5. In no case shall equipment with radioactivity above the release levels be allowed to leave the Site.

B. Loadout

1. All loadout of material will be done as required by these Specifications and the Work Plan. Loading of trucks and other containers with contaminated soil or debris shall be done only in the loadout or equipment decontamination areas.

2. Contaminated soils and debris will be loaded directly into containers as they are excavated, and the container staged in a clean area for pickup and transport to the rail terminal. Materials will be placed so they do not extend above the sides of the container. Materials protruding above the sides of the container will be pushed down or removed for placement into another container. If isolated quantities of impacted soil are encountered in volumes less than necessary to fill a container, the material will be placed in Supersacks and stored temporarily until there is sufficient material accumulated to fill a container.

3. Rolloff containers will be secured with lids.

4. Drivers shall remain inside the truck with the windows closed or shall exit the truck prior to loading.

C. Decontamination

1. Detailed requirements for the decontamination of trucks and containers are provided in Section 01020 of these Specifications.

2. Following loading in the loadout area, and decontamination if such is necessary, all trucks and containers will be frisked.

3. If frisking shows such is necessary, trucks and containers will be decontaminated by wiping or spraying.

4. Trucks and containers need a final survey prior to unrestricted release from the loadout.

D. Transport

1. Trucks picking up and dropping off containers at the staging areas outside of the loadout need not be decontaminated unless a container spill has occurred.

2. Trucks shall only use the designated route(s) to transport materials from the Site to the rail terminal, and shall obey all signs, speed limits and other traffic laws. Any driver not obeying traffic laws, or the requirements of these Specifications, shall be removed from the work.

3. All trucks shall properly display decal with all information required for transport of contaminated materials.

4. Each truck shall carry the standard industry bill of lading for each shipment to the rail terminal.

5. All truck drivers shall have the training required by 29 CFR 1910.120 and shall be trained in the procedures to be used in the event of an emergency, as described in the Emergency Contingency Plan.

3.6 Storage

A. All storage or stockpiling of materials shall be done as required by Section 02200 of these Specifications and described in the Work Plan.

B. On the Subject Site

1. Non-radioactive materials, including fill, may be temporarily stockpiled (staged) on the Site in the locations noted in the Work Plan, or as approved or directed by STS or its Agent.

   a. As necessary, staged non-radioactive materials shall be covered or otherwise managed to control dust.

2. Radioactive materials may be staged on the Site only with written approval from the STS Project Manager or its Agent.

   a. Radioactive materials shall only be stored on contaminated or specially prepared areas to minimize the potential for contamination of "clean" areas.

   b. All staged radioactive materials shall be removed from the Site by the end of the day, weather permitting. If materials must be left overnight, security will be provided. If isolated quantities of impacted soil are encountered in volumes less than necessary to fill a container, the material will be placed in Supersacks and stored temporarily until there is sufficient material accumulated to fill a container.

c. Except when work is actively in progress, the staged contaminated materials that are not containerized shall be stored temporarily in Supersacks on-site. Radiologically-impacted material that cannot be placed in containers for overnight storage will not be excavated.

C. On the Rail Terminal Site

1. Loaded and tarped containers will be stored at the rail terminal temporarily until the appropriate train is loaded and dispatched to the permanent disposal facility.

3.7 Disposal

A. At a minimum, all materials shall be disposed as required by the permits, these Specifications, and the laws, rules and regulations of the State of Illinois or the USEPA, whichever are more stringent. All materials to be disposed shall be surveyed as required by Section 01020 of these Specifications to determine they are suitable for the intended disposal method and location.

B. If clean materials are disposed by landfilling or recycling, the Contractor shall provide the STS Project Manager and the Field Team Leader with the name of the landfill or recycler.

1. The landfill or recycler must be qualified to receive the waste. The landfill or recycler must provide the Contractor with qualification information.

2. The STS Project Manager or its Agent has the right to reject any landfill which does not meet qualification standards.

3.8 Cleanup

Upon completion of work in this section, all rubbish and debris shall be removed from the job site. Soils or fill materials that were excavated from the site and were determined not to exceed the radiological cleanup standard of 7.1 pCi/g total radium (Ra-226 + Ra-228) may be used or redeposited on the site as fill material. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition.

LAKESHORE EAST

Title: Contaminated Material Loadout and Earthwork

Section 02200

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

SECTION 02200

CONTAMINATED MATERIAL LOADOUT AND EARTHWORK

PART 1 - GENERAL

1.1 Scope

A. General

1. Detailed descriptions of the landscaping, structures, etc. for the Site are included in the Work Order of which these Specifications are a part.

1.2 Related Work

A. Division 1 Sections of these Specifications

B. Section 02010 - Demolition and Debris Removal

D. Section 02840 - Site Utilities

1.3 Site Investigation

A. Investigation Reports

Investigation reports prepared by STS Consultants, Ltd. dated September 19, 2002, September 28, 2001, January 8, 2002 and February 8, 2002 are available from the owner. These reports may be used as a guide to conditions on this project as they contain boring summaries and related information depicting surface and subsurface conditions at specific locations at the Site. Surface and soils conditions at other locations may differ from conditions occurring at the boring locations. Therefore, further investigations will be done prior to and during the excavation activities.

B. Contractor's/Subcontractor's Responsibility

The Contractor/Subcontractor shall carefully examine the Site and make all inspections necessary in order to determine the full extent of the work. The Contractor/Subcontractor shall satisfy himself as to the nature, location and conditions of the work, the conformation and condition of the existing ground surface, and the character of equipment and facilities needed prior to and during prosecution of the work. The Contractor/Subcontractor shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. Any inaccuracies or discrepancies between the actual field conditions and the Work Order, or between the Work Order and Specifications, must be brought to the attention of the Project Coordinator in order to clarify the exact nature of the work to be performed.

1.4 Health and Safety

A. Detailed discussions of the potential hazards and the requirements for minimizing the potential for harm to project and offsite personnel, and to the environment, are provided in Section 01020 and Article 1.5 of this section of these Specifications.

B. All work shall be done under the supervision of personnel experienced and qualified for the work.

C. All work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

D. Based on preliminary results, sampling and analyses of soils from the Site indicate levels of radioactivity in the soils above background levels. Based on the sampling and surveys, the work can proceed under Level D personal protection conditions. Air and soil monitoring and sampling will be done during the conduct of the work to determine if modifications to Level D work conditions are necessary (see Sections 01020 and 02010 of these Specifications). A complete description of health and safety requirements for this site is provided in the Health and Safety Plan (HASP) for this project.

1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by the Respondents or his Agent.

2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal, equipment and vehicle decontamination) with minimal delay. The requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing levels of radiation above background encountered are discussed in Section 02010 of these Specifications.

E. The Field Team Leader or Health and Safety Coordinator may bar any person from the site who, in their opinion, shows a disregard for health and safety requirements.

1.5 Environmental Safeguards and Regulations

A. The Contractor shall comply with all federal, State, and local regulations, and the requirements of these Specifications at all times to prevent pollution of air, water and soil.

B. The Contractor will preserve and protect all structures, equipment, and vegetation (such as trees, shrubs and grass) on or adjacent to the work area, which is not to be removed and which does not unreasonably interfere with the excavation or restoration work. The Contractor will only remove trees when such is required by the Work Order and will avoid damaging vegetation that will remain in place. Limbs or branches of trees broken by the contractor will be trimmed with a clean cut, and the cut painted with a tree-pruning compound.

C. The Contractor will control air and water pollution as described in these Specifications and the Work Plan.

1.6 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to the Quality Assurance Supervisor prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

1.7 Submittals

A. All submittals shall be made to the Respondents or their Agent, with copies submitted to the Field Team Leader.

B. The Contractor shall maintain a log of those submittals directed by the Respondents.

C. Import Backfill Materials

1. The Contractor will submit a list showing materials expected to be imported, and the name(s) and locations of the supplier(s) of each type of material.

2. Submit analyses such as radioactivity, geotechnical, gradation, and proctor test results of backfill materials, and certification of conformance with material specifications as determined by the testing consultant for each material, in accordance with testing per Section 2.E of this specification.

3. The above information shall be submitted with the Work Order for the Site for each source, prior to use.

D. Imported Backfill Material Truck Tickets

1. Submit imported backfill material truck tickets no less than five days prior to submittal of application for payment of the applicable items of work. Minimum required information on truck tickets includes the following.

   a. Date of delivery.

   b. Material description.

   c. Truck identification number or license number.

   d. Gross weight and tare weight or volume of load.

   e. Supplier name/source.

   f. Signatures of scale operator and truck driver.

2. Truck tickets without the above information will not be accepted for payment.

E. Soil Compaction Test Report

1. Submit soil compaction test reports indicating test results from the testing consultant. The Contractor shall be prepared to provide preliminary test results within 24 hours of the test. Final test results shall be submitted to the Contractor and available for review within seven days of testing.

2. Test results shall include time and date of test, test methodology, location of test, name of person and firm conducting the testing, and any pertinent information which may affect the test results.

1.8 Definitions

A. Excavation. Excavation is defined as reaching the lines, grades, elevations and contamination depths shown in the Work Order or determined by in-place monitoring. Excavation of uncontaminated topsoil, silt, clay, sand, gravel, talus, soft or disintegrated rock, boulder or detached pieces of soil rock or debris shall be included, as well as excavation of contaminated material. During the excavation work, monitoring of radiological contamination of the excavated material will be done by the Respondents.

B. Contaminated Soil

1. Soil which must be excavated, transported, or disposed under special conditions. Soil from these sites may have levels of radioactivity above background. Determining the vertical and horizontal extent of contaminated soil will be the responsibility of the Respondents.

2. Soils containing concentrations of Ra-226 plus Ra-228 greater than five picoCuries per gram (5 pCi/g) of dry soil above natural background averaged over six-inch thick layer are considered radioactively contaminated.

C. Salvaged Excavation Materials Uncontaminated soil materials from designated areas of the Site suitable for use as common or structural fill which are not otherwise classified as unsatisfactory (see Part 2 of this Section). Unless otherwise directed by the Work Order or the Respondents' Agent, salvaged excavation materials shall be used to backfill designated onsite excavations a minimum of six inches below finished grade.

D. Overexcavation. Excavation of any type of material in excess of the lines, grades or depths indicated in the Work Order or beyond the limits defined by the Work Order or Specifications.

E. Unsatisfactory Fill Materials Unsatisfactory materials for fill include, but are not limited to, materials containing organic matter, trash, debris, frozen materials, materials containing radioactivity or other hazardous contaminants in excess of regulatory standards, and materials not meeting the criteria of Part 2 of this section. Materials which are unsuitable due to excessive or insufficient moisture or gradation may be used if they can be brought into compliance with the requirements of Part 2 of this section by screening, manipulation, aerating, watering, or blending with other suitable materials. Unsatisfactory fill materials shall not be used.

F. Percent Maximum Density. Percent maximum density is a percentage of the maximum density at optimum moisture obtained by the appropriate test procedure.

G. Stockpile Construction. Stockpile construction is defined as construction of a stabilized fill which will serve as a temporary storage stockpile constructed of contaminated or uncontaminated materials.

H. Subgrade Preparation Subgrade preparation includes fine grading, scarification and compaction, of existing ground, upon which additional materials will be placed.

1.9 Applicable Publications.

The publications listed below form a part of these Specifications to the extent referenced. The publications are referred to in the text by the basic designations below.

1. American Society for Testing and Materials standard methods of testing. Hereinafter designated as ASTM. The letters and numbers following ASTM (e.g., D698) refer to a particular test.

2. Standard Specifications for Road and Bridge Construction, Illinois Department of Transportation. Hereinafter referred to as State Specifications.

3. Standard Specifications for Water and Sewer Main Construction in Illinois, Fourth Edition.

4. City of Chicago Zoning Ordinances.

1.10 Quality Assurance

A. The Respondents shall make available soil-testing services, either through its own forces or through a soils-testing consultant. The Respondents shall be responsible for taking soil samples and performing moisture-density, gradation, and other tests to ascertain the completed work is in compliance with these Specifications. Samples may be taken at the place of excavation, stockpiles, or from the fill itself. The Respondents shall conduct density and other tests on the fill as required by these Specifications. The Contractor shall assist the Respondents as necessary to enable sampling and testing.

B. The Field Team Leader shall be a person qualified and experienced in the work described in these Specifications.

C. By Contractor/Subcontractors

1. All work shall be done under the supervision and control of experienced and qualified personnel, competent in the areas of expertise required for the work described in these Specifications and other documents.

2. The Contractor, at his discretion, may have such tests and inspections as he may desire performed by other qualified personnel or independent testing services, for his guidance and control of the work. The cost for such tests and inspections shall be borne by the Contractor. The Quality Assurance Supervisor will consider the results of such testing in determining whether work has been properly done, but the approval of work shall be made by the Respondents or their Agent.

D. Applicable Criteria. Tests and Standards

1. For Excavation of Radioactive Soils. Detailed descriptions of the testing methods and equipment for radioactive soils are described in the Verification Sampling Plan. All soils containing concentrations of Ra-226 plus Ra-228 greater than five pCi/g of dry soil above background, averaged over a six inch layer, shall be removed.

2. For Disposal of Radioactive Soils. All contaminated soils will be disposed in the manner approved by the USEPA. At present, this is to transport the material to a facility licensed to accept these materials for disposal.

3. For Site Earthwork

a. Except for grading and fill under pavement, slabs or structures, surfaces shall be excavated, or filled or graded to plus or minus 0.2 feet (±0.2') of line, slope and elevation shown in the Work Order, provided in these Specifications, or as directed by the Project Coordinator or Field Team Leader.

b. Areas under pavement, slab or structures shall be filled and/or graded to t0.1 feet.

c. The Contractor will provide survey control for establishing and maintaining excavation and fill. Cut and fill stakes will be placed as necessary, but at least on 50-foot centers, to control excavation and fill. All surveys required to meet City of Chicago earthwork permit requirements shall be performed by a licensed land surveyor. Other surveying will be done by an experienced line and grade surveyor.

d. Following completion of the work, the Site shall be surveyed to confirm all regrading and reconstruction work has been done to proper line and grade.

4. Compaction

   a. Compaction of backfilled common materials shall be to at least 90 percent of maximum density (standard proctor - ASTM D698) for areas not covered by structures, paving or slabs, to at least 95% of maximum density for areas to be covered by paving or slabs, and to at least 95% for areas under structures and utilities.

   b. Compaction of backfilled select or structural materials shall be to at least 92% of maximum density (standard proctor - ASTM D698) for areas not covered by structures, paving or slabs, to at least 95% of maximum density for areas to be covered by paving or slabs, and to at least 95% for areas under structures and utilities.

   c. Maximum densities and optimum moisture information can be obtained from borrow area operators; if this information is not available, the Contractor shall obtain samples representative of all soils to be used for common backfill and provide them to the Respondents or their Agent for testing. Test samples will be provided before backfilling begins.

5. Compaction Testing shall be done on at least 50-foot centers or at least once per lift. Compaction will be tested and determined by competent personnel using methods such as nuclear density gauges (if proper calibration can be achieved), sand cones, or other methods. Compaction work shall be sufficiently observed and all areas of a lift shall be visually inspected by the Respondents or their Agent and the Field Team Leader so they can state their opinion that areas not tested for compaction have been compacted as tested areas.

6. Soils testing. All soils testing (gradations, liquid limits, etc.) will be done using American Society for Testing and Materials (ASTM) procedures and methods.

7. For Cleanup The Contractor shall remove all rubbish, debris, junk, temporary materials, and any surplus excavated materials from the Site, as directed by the Respondents or their Agent. Excavation and proper disposal of these materials and the restoration of staging and storage areas and temporary roads to the satisfaction of the Respondents or their Agent shall be a condition for final acceptance.

PART 2 - PRODUCTS

2.1 Backfill Materials

A. General - Fill materials shall be obtained from suitable stockpiles or borrow as defined in these Specifications. Materials containing organic (except topsoil), perishable, spongy, frozen, expansive or other deleterious materials shall not be acceptable.

B. Materials for Common Fill shall consist of any material imported or excavated from the cut or other borrow sources that, in the opinion of the Respondents or their Agent, are suitable for use in constructing fills. The material shall contain no rocks or hard lumps greater than four (4) inches in size and shall contain at least 40 percent of material smaller than 1/4-inch sieve opening in size. No material of a perishable, spongy, or otherwise improper nature shall be used in filling.

C. Imported Fill

   1. Roadbase materials shall conform to State Specifications Section 704.

   2. Crushed Rock or Stone for use as fill shall conform to State Specifications Section 704.01.

   3. Fine Aggregate or Sand shall conform to State Specifications Section 703.04.

4. Structural Fill under building slabs, ramps, and stairs shall conform to State Specifications Section 704.04, CA-6 or CA-10.

5. Selected Granular Backfill shall conform to Section 20-2.21 C of the Standard Specifications for Water and Sewer Main Construction in Illinois, FA-1 or FA-2.

D. Material placed within 24 inches of rough grade shall be select material that contains no rocks or hard lumps greater than four (4) inches in size and that swells less than 3% when compacted as hereinafter specified for compacted fill.

E. Soils testing

a. Prior to use, all off-site soil sources shall be tested as follows:

1. Radioactivity Material must be tested for radioactivity and found to be within background ranges (3.7 pCi/g as established by the USEPA in Tech Memo date March 15, 1995).

2. Engineering Classification ASTM D2487

3. Standard Proctor Compaction ASTM D698

b. Provide one series of tests for each 10,000 cubic yards of borrow soil used. At least one series of tests will be obtained from each borrow source to be used.

c. Testing of potential on-site soil backfill is described in the Field Sampling Plan.

PART 3 - EXECUTION

3.1 General

A. The work performed under these Specifications shall be constructed to the lines, grades, elevations, slopes and cross-sections indicated in the Work Order, specified herein, and/or directed by the Respondents or their Agent. Slopes, graded surfaces, and drainage features shall present a neat uniform appearance upon completion of the work.

B. It shall be the Contractor's responsibility:

1. To maintain adequate safety measures and working conditions.

2. To take all measures necessary during the performance of the work to protect the entire project area and adjacent properties which would be affected by this work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material, until final acceptance by the Respondents or their Agent.

3. To maintain completed areas until the entire project area is in satisfactory compliance with the Specifications.

C. Utility lines and structures indicated in the Work Order which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

1. Where utility lines or structures not shown in the Work Order are encountered, the Contractor shall report them to the Respondents or their Agent before proceeding with the work.

2. Unless their excavaiion is necessary to allow work to proceed or as a result of contamination, the Contractor shall bear the cost of repair or replacement of any marked utility lines or structures which are broken or damaged by his operations.

3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work. A description of the requirements may be requested to be provided to the Respondents and the Field Team Leader before any work is done.

3.2 Excavation and Restorations. Clearing and Grubbing

A. Clearing. Clearing consists of the complete excavation of objectionable materials and obstructions above and below the ground surface, including tree stumps, brush, grass, vegetative matter and other objectionable materials within the project limits. All brush and organic material shall be removed before placing any earth fill unless the earth fill to be placed is topsoil.

B. Grubbing, Grubbing consists of the complete excavation of stumps, including tap roots or lateral roots 1-1/2 inches or more in diameter, and the excavation of brush, grass or weeds to depths below the natural ground as specified herein. Stumps shall be grubbed to a depth of 3 feet and grass or weed shall be grubbed to a depth of 12 inches below the natural ground surface, or to the depths as determined in the field by the Respondents or their Agent at the time of construction.

C. Protection. Existing items not designated to be demolished or removed shall be protected from damage. Any such item damaged by the Contractor shall be restored or replaced immediately at the Contractor's expense.

D. Debris and Surplus Material. All debris and surplus material resulting from clearing, and grubbing shall be removed from the site and properly managed by the Contractor. The requirements for managing concrete and asphalt materials are described in Section 02010 of these Specifications.

3.3 Dust Control

The Contractor shall take all steps practical to control dust arising from the construction activity. Detailed discussions of the requirements and potential methods for controlling dust are described in Appendix A of the Work Plan.

3.4 Control of Drainage Water

A. The Contractor shall control drainage water in the area of construction operations, and control storm water and wastewater reaching the construction area from any source, so that no damage will be done to the work or to the environment. The Contractor shall be responsible for any damages to persons or property on or off the construction site due to such drainage water or to the interruption or diversion of such storm water or wastewater on account of his operations.

B. Surface grading shall be done as may be necessary to prevent surface water from flowing into excavations.

   1. Any water accumulating therein shall be removed by pumping or by other approved methods.

   2. Any water accumulating in a work area which may be contaminated will be tested prior to disposal. If contaminated, such water will be disposed as directed by the Respondents or their Agent.

   3. Any water which is the result of the Contractor's failure to properly control drainage will be removed and disposed at the Contractor's expense.

3.5 Excavation

A. General

1. The locations of surveyed benchmarks and estimated depths of cut for beginning the work are shown in the Work Order. The Contractor shall be responsible for providing additional staking and surveying, including both horizontal and vertical controls, to ensure the Work is done to the standards of these Specifications. The Project Coordinator and Field Team Leader will be available to assist and advise the Contractor.

2. The Contractor shall perform all excavation necessary or required as shown in the Work Order, or required by these Specifications or the Respondents or their Agent. The excavation shall include the disposal or stockpiling of all materials of whatever nature encountered, which shall include both contaminated soil excavation and common soil excavation when both are present, and shall include the furnishing, placing, and maintaining of shoring and bracing necessary to safely support the sides of the excavations.

3. If the horizontal and vertical limits of excavation, as determined by radiological testing, are less than shown in the Work Order, the Contractor shall excavate only those materials necessary to achieve compliance with the standards of these Specifications.

4. If the horizontal and vertical limits of excavation, as determined by radiological testing are greater than shown in the Work Order, the Contractor shall extend the limits of excavation as necessary to achieve compliance with the standards of these Specifications.

5. Excavated material shall be placed a sufficient distance from the edge of the excavation to avoid cave-ins or bank slides. In no case shall excavated materials be placed closer than three feet to the edge of the excavation.

6. Shoring and bracing, if necessary, shall be designed by a qualified Professional Engineer competent in soils engineering.

7. The work also shall include all pumping, ditching and other required measures for the removal or exclusion of water.

B. Contaminated Soils

1. Interpretation of the Work Order

   a. The Work Order indicates the estimated horizontal and vertical extent of a contaminated deposit.

   b. Depths of contaminated and uncontaminated soils indicated in the Work Order represent the total estimated depth from the ground surface to the base of the contamination. The different depths shown across a given deposit are an indication of how the actual contamination depths might be expected to change throughout a given deposit.

   c. Information in the Work Order indicates the existing surface cover material. Unless otherwise indicated in the Work Order, the replacement surface cover shall match existing.

   d. All contaminated materials, including clay, silt, sand, gravel, cobbles and boulders, and rock will be excavated. The Contractor shall be prepared to conduct whatever excavation is necessary to remove contaminated materials.

2. Excavation Procedures

a. If possible, contaminated material shall be removed from outlying areas and boundaries of contaminated areas, working toward the equipment decontamination and loadout facilities, to minimize the potential to contaminate "clean" areas.

b. Truck or container loading shall be done only on ground contaminated and designated for cleanup or on the equipment decontamination pad or other area specially prepared for such work. Care should be taken to avoid spilling during loading.

c. Contaminated (see Subpart 1.8, B, Definitions of this section) and uncontaminated soils shall be separated during excavation and kept separate during loading, transport and stockpiling to minimize the potential for cross-contamination.

d. Excavations shall be performed carefully to minimize the potential for mixing with underlying soils. Also, cleated or crawler-type equipment shall not be allowed without prior approval of the Respondents or their Agent.

e. Excavations will be radiologically monitored and surveyed by the radiologic technicians to determine if additional material must be removed. Detailed descriptions of the radiological monitoring requirements during excavation are provided in applicable SOPs.

f. The Contractor shall excavate contaminated and uncontaminated soil to within three inches of the design or estimated depth. From this point, excavation should proceed in no greater than six-inch lifts to the depths indicated in the Work Order. After excavation of each lift, the Respondents will radiologically monitor the excavation and delineate additional excavation required (see the Field Sampling Plan).

g. Exceptions to these requirements must be approved in writing by the Respondents or their Agent and provided to the Field Team Leader. The Contractor will not be paid for removing extra quantities resulting from a deviation from the above requirements, unless a specific deviation has received prior written approval.

D. Other

Uncontaminated material, including clay, silt, sand, gravel, cobbles and boulders and rock, may need to be removed for slopes on excavations, to expose contaminated soils, structures or facilities, or to facilitate work to remove contaminated soils, structures or facilities. Common materials removed from such areas may be used for backfill if they meet the requirements for fill material. If unsuitable, they shall be removed, transported and disposed as surplus excavation.

3.6 Contaminated Material Loadout and Transport

A. General Requirements

1. Before beginning contaminated material loadout operations, the Contractor shall construct temporary site drainage facilities and initiate dust control measures. The Contractor also shall construct all decontamination and loadout facilities and establish survey controls.

2. The Contractor shall use equipment and methods that minimize the potential for spillage of materials during loading operations.

3. At a minimum, the truck loadout shall be cleaned (liquid and nonliquid wastes removed) at the end of every day. Spilled materials shall be promptly removed from the loading facility if the quantity is such that the material will be picked up and transported out of the loadout facility (e.g., dirt clods which could stick to tires).

4. All decontamination of equipment shall be done as required by Section 01020 and this section of these Specifications.

B. Loadout

1. All debris, such as concrete, asphalt, etc., shall be managed as described in Section 02010 of these Specifications.

2. All loadout of material will be done as required by these Specifications and the Work Order prepared by the Contractor. Loading of trucks and other containers shall be done only in the loadout or equipment decontamination facilities.

3. Unless staging areas have been selected by the Contractor and approved by the Respondents or their Agent, soils and debris will be loaded directly into trucks or containers as they are excavated, for transport to the rail terminal. Materials will be placed so they do not extend above the sides of the truck bed or container. Materials protruding above the sides of the truck or container will be pushed down or removed for placement into another truck or container by loading equipment or personnel.

4. Truck beds and containers will be tightly covered with tarps.

5. Truck drivers will generally not enter the Contamination Reduction Zone, but shall remain inside the truck when such entry is required.

C. Decontamination

1. After a truck or container has been loaded and tarped, it will be checked for contamination. The truck tires, body and outside of the bed and the outside of the container will be frisked to determine if contaminated soils are present. If frisking does not detect any contamination, the equipment may be released for travel.

2. If frisking does detect contamination the truck or container will be decontaminated by wiping or spraying.

3. Following decontamination, all trucks and containers shall be frisked for release. If any radioactivity above release levels (see Table 02200-1 at the end of this section) is found, decontamination of those areas will be continued. If spraying or wiping is ineffective in removing contamination, brushes or other means shall be used until release levels are achieved. In no case shall a truck or container with radioactivity above the release levels be allowed to leave the site.

4. After containers are loaded and frisked for release, they- shall be staged in a clean area on the site. The trucks used to transport the containers to the rail yard will not need to be frisked prior to leaving the site, as long as the transport trucks do not enter the Contaminant Reduction Zone.

D. Transport

1. Trucks shall use only the designated route(s) to transport containers with contaminated materials from the Site to the rail terminal, and shall obey all signs, speed limits and other traffic laws. Any driver not obeying traffic laws, or the requirements of these Specifications, shall be removed from the work.

2. All trucks shall properly display a decal with all information required for transport of contaminated materials.

3. Each truck shall carry the standard industry bill of lading for each shipment.

4. All truck drivers shall have the training required by 29 CFR 1910.120 and shall be trained in the procedures to be used in the event of an emergency (see Section 01020, Articles 3.2 and 3.7, of these Specifications, and the Emergency Contingency Plan).

3.7 Fill

A. General

1. Unless otherwise specified, fill material shall be compacted by the Contractor to a density that is not less than 90% of the maximum density, standard proctor (ASTM D698).

2. The upper 18 inches of fill material placed in lawns and other areas to be revegetated shall not be compacted beyond that density needed to provide a stable land surface.

3. In areas where contaminated materials have been removed, the Contractor shall not begin backfilling until a radiological survey has been completed as described in Sections 01010 and 02010 of these Specifications and Appendix E to the Work Plan.

4. All fill shall be final graded to the requirements of Part 1 of this Section. After backfilling is completed, the fill (including topsoil) shall be graded to blend with existing contours where future construction will not be done.

B. Preparing Areas to be Filled

1. All vegetable matter and coarse material which might prevent compaction shall be removed by the Contractor from the surface upon which the fill is to be placed. Any loose and porous soils shall be removed or compacted to a depth specified by the Respondents or their Agent. The surface shall then be plowed or scarified until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

2. Where fills are constructed on hillsides or slopes, the slope of the original ground on which the fill is to be placed shall be stepped or keyed by the Contractor. The steps shall extend completely through the soil mantle, if any, and into the underlying formation materials.

3. Fill shall not be placed on ground which has frozen, unless the ground can be worked (e.g., *scarified and recompacted) to remove the frost.*

C. Placing and Spreading Fill Material

1. The Contractor shall not commence backfilling until a radiological survey of the excavation has been completed which verifies all contaminated materials have been removed as required by these Specifications, and the Field Team Leader has provided the Contractor with verbal authorization to begin backfilling.

2. Fill shall be placed to the line, elevation and grade as required by these Specifications, shown in the Work Order, or described or shown in the Contractor's Work Order for this Site. Unless otherwise approved in writing by the Respondents or their Agent, the Contractor shall use fill stakes to guide backfilling.

3. *Salvaged soil materials shall be used for backfilling unless determined unsuitable by the* Respondents or their Agent.

4. When conditions require that contaminated soil will be left in place, backfill will be placed against contaminated soils. In this situation, a six mil polyethylene barrier will be placed to mark the separation between the soils and to minimize the potential for contaminated soils to fall into the "clean" area. Care will be taken during subsequent operations to prevent contaminated soils from mixing with "clean" soils.

5. Fill material to be compacted shall be placed by the Contractor in one foot , even, continuous layers. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to obtain uniformity of material in each layer.

6. Uniform moisture distribution in the fill to be compacted shall be obtained by discing, blading or other approved methods prior to compaction of a layer.

   a. When the moisture content of the fill material is insufficient to achieve specified density requirements, water shall be added by the Contractor until the moisture content is as specified.

   b. When the moisture content of the fill material is too high to achieve specified density requirements, the fill material shall be aerated by the Contractor by blading, mixing, or other satisfactory methods until the moisture content is reduced.

7. Unless otherwise shown in the Work Order, the Contractor shall maintain a minimum of 10 feet of separation between excavation of contaminated soils and placement of clean fill.

8. Fill on City of Chicago street rights-of-way shall be done as required by City of Chicago Standard Specifications.

D. Compaction

1. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted by the Contractor to the required density (see below).

2. Compaction shall be accomplished by sheepsfoot rollers, vibratory rollers, multiple-wheel, pneumatic-tired rollers or other types of acceptable compacting equipment.

   a. Selection of compaction equipment will be at the discretion of the Contractor. Equipment shall be of such design that it will be able to compact the fill to the specified density.

   b. In areas not accessible to or suitable for larger self-propelled roller or vibratory equipment (e.g., small areas, within 12 inches over the top of utilities, etc.), the maximum loose-layer thickness will be four inches.

   c. Compaction shall be continuous over the entire area and the equipment shall make sufficient passes over the material to ensure that the desired density has been obtained over the entire area.

   d. The surface of fill slopes shall be compacted so that the slopes are stable and there shall be no excessive loose soil on the slopes.

3. Roadbase backfill shall be compacted to at least 95% of maximum density (ASTM D698 - standard proctor).

4. Common backfill shall be compacted as follows:

   a. To at least 90% of maximum density (ASTM D698 - standard proctor) for all areas except as noted below.

b. To at least 95% of maximum density (ASTM D698 - standard proctor) for all areas to be covered with paving.

c. To at least 95% according to ASTM D698 in City of Chicago street right of-ways where asphalt will be placed, except for the upper six-inch layer which will be compacted to not less than 100%.

5. Structural fill under buildings, slabs, ramps and stair shall be compacted to at least 95% of maximum density (ASTM D698).

6. Compaction will not be required in the upper 18 inches of soil placed in lawns or other areas to be revegetated.

E. When an area has been prepared to receive concrete or asphalt, applicable moisture and density requirements shall be maintained in the upper layer until the surface construction is completed.

F. The Contractor shall provide and maintain adequate erosion and drainage control facilities during the construction of the fill areas. The erosion control facilities shall be maintained in optimum condition until the work is complete. The facilities shall be inspected following significant rainfall, repairs made and excess sediment removed. It shall be the Contractor's responsibility to prevent the discharge of sediment offsite or to adjacent water courses.

G. Backfill around Utilities. In any case where utilities are disturbed or exposed, all repair work shall be done in accordance with the requirements of the utility, or the governing agency (see Specification 02840 Site Utilities).

3.8 Storage(Stockpiling)

A. On the Site

1. Non-radioactive materials, including fill, may be temporarily stockpiled on the Site in the locations noted in the Contractor's approved Work Order, or as approved or directed by the Respondents or their Agent.

a. As necessary, staged non-radioactive materials shall be covered or otherwise managed to control dust.

b. Non-radioactive materials shall be removed from the vicinity of the property by the end of the work.

2. Radioactive materials may be staged (temporarily stored) on the Site in locations noted in the Contractor's approved Work Order.

a. If not in the approved Work Order, radioactive materials may be staged on the Site only with written approval from the Respondents or their Agent. These materials shall only be stored on contaminated or specially prepared areas to minimize the potential for contamination of "clean" areas.

b. Except when work is actively in progress, the staged materials shall be completely covered with impermeable plastic sheeting or other approved covers.

3.9 Disposal

A. At a minimum, all materials shall be disposed as required by the permits, these Specifications, and the laws, rules and regulations of the USEPA, State of Illinois, and the State of Utah.. All materials disposed off the Site shall be surveyed as required by Section 01020 of these Specifications to determine they are suitable for the intended disposal.

B. If the materials are disposed by landfilling or by recycling, the Contractor shall provide the Respondents or their Agent and the Project Coordinator with the name of the landfill or recycler.

1. The landfill and recycler must be qualified to receive the waste. Qualification information must be provided for the landfill or recycler, by the Contractor.

2. The Respondents or their Agent has the right to reject any landfill or recycler which does not meet qualification standards.

3.10 Landscaping

Following completion of backfilling to proper line, elevation and grade, the Contractor shall return to the site and reinstall or replace all designated items to at least original condition, or as otherwise agreed by the Respondents and the property owner. This includes paving, slabs, fences, retaining walls, sprinkler systems, sod, shrubs, bushes, trees and any other appurtenant landscaping, facilities and structures which were removed for or damaged by the work.

3.11 Surveying

A. A baseline will be established for the Site. This baseline will be tied to the previous U.S. EPA survey done for the property.

B. Items including, but not limited to, the following will be located or identified in relation to the baseline.

1. Visible property boundaries.

2. Landscaping.

3. Facilities.

4. Structures.

5. Utilities.

6. Limits of radioactive contamination. Using the results of previous investigations and the baseline, sufficient stakes or markers will be placed to visibly mark the limits so any contaminated soil can be properly removed.

C. The baseline, as above, and the previous surveys also will be used to locate grids for verification surveying. The size of the grids will depend on the location and the extent of contamination.

D. The work for locating items such as the above can be done with equipment and materials such as the following:

1. Theodolite.

2. Compass.

3. Cloth or steel measuring tape.

3.12 Cleanup

Upon completion of work in this section, all rubbish, debris and excess soils (including fill materials) shall be removed from the job site. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition. Proper cleanup of the properties shall be a condition of acceptance of the work and final payment.

TABLE 02200-1
RELEASE CRITERIA

From U.S. NRC, Regulatory Guide 1.86, Table 1

Nuclide [a]	Average [b,c]	Maximum [b,d]	Removable [b,e]
U_{nat}, U_{235}, U_{238}, and associated decay products	5,000 dpm α per 100 cm^2	15,000 dpm α per 100 cm^2	1,000 dpm α per 100 cm^2
Transuranics, Ra_{226}, Ra_{228}, Th_{230}, Th_{228}, Th_{230}, Pa_{231}, Ac_{227}, I_{125} and I_{129}	100 dpm per 100 cm^2	300 dpm per 100 cm^2	20 dpm per 100 cm^2
Thnat, Th_{232}, Sr_{90}, Ra_{223}, Ra_{224}, U_{232}, I_{126}, I_{131} and I_{133}	1,000 dpm per 100 cm^2	3,000 dpm per 100 cm^2	200 dpm per 100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr_{90} and others noted above.	5,000 dpm β-γ per 100 cm^2	15,000 dpm β-γ per 100 cm^2	1,000 dpm β-γ per 100 cm^2

a Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

b As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

c Measurements of average contaminant should not be averaged over more than one square meter. For objects of less surface area, the average should be derived for each such object.

d The maximum contamination level applies to an area of not more than 100 cm^2.

e The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

LAKESHORE EAST

Title: Site Utilities

Section 02840

Revision Number: 0

Date: June 19, 2002 Replaces: New

SECTION 02840

SITE UTILITIES

1.0 GENERAL

1.1 Scope

A. This section describes the general requirements for locating, protecting, removing and installing site utilities.

B. The known locations of utilities will be marked prior to start of work by utility locating contractors (DIGGER)..

1. Excavation to or below the locations of known utilities is expected as part of the work for the Site.

2. Utility lines and structures which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work.

1.2 Related Work

A. Division 1 Sections of these Specifications

B. Section 02010 - Demolition and Debris Removal

C. Section 02200 - Contaminated Material Loadout and Earthwork

1.3 Health and Safety

A. Detailed discussions of the potential hazards and the requirements for minimizing the potential for harm to project and offsite personnel, and to the environment, are provided in Section 01020 of these Specifications and the HASP.

B. All work shall be done under the supervision of personnel experienced and qualified for the work.

C. All work will be done as required by OSHA regulations published in 29 CFR 1910 and 1926. These regulations are included by reference in these Specifications.

D. Sampling and analyses of soils from the Site indicate levels of radioactivity in the soils above background levels. Based on the sampling and surveys, the work can proceed under Level D personal protection conditions (see HASP). Air and soil monitoring and sampling will be done during the work to determine if modifications to Level D work conditions are necessary (see Section 02010). Complete descriptions of health and safety requirements for this Site are provided in Section 01020 of these Specifications and the HASP.

1. The Contractor shall be prepared to discontinue work in an area and begin work in an alternate area if monitoring and sampling indicate changes in the work conditions may be necessary and if so directed by STS Consultants, Ltd. (STS).

2. The Contractor shall be prepared to begin working under changed conditions (greater than or equal to Level D personal protection with appropriate personal equipment and vehicle

decontamination) with minimal delay. The requirements which may be necessary if asphalt, concrete, wood, metal or other construction materials containing hazardous materials or levels of radiation above background are encountered are discussed in Section 02010 of these Specifications.

E. The Field Team Leader or Health and Safety Coordinator may bar any person from the Site who, in their opinion, shows a disregard for health and safety requirements.

1.4 Environmental Safeguards and Regulations

The Contractor shall comply with all federal, state, and local regulations, and the requirements of these Specifications at all times to prevent pollution of air, water and soil. Detailed requirements for the protection of the environment are provided in Section 01020 and the HASP.

1.5 Permits

A. The Contractor shall be responsible for obtaining all permits required for the work and additions described in this section of these Specifications.

B. Copies of all the necessary permits shall be provided to STS or their Agent and to the Project Manager prior to beginning the work.

C. At a minimum, all work shall be done in accordance with the requirements of the permits or, if the work is exempted under CERCLA from any permits, in accordance with the substantive requirements which would apply if the work were not exempted from such permits. The requirements of these permits are included by reference in these Specifications. Where the requirements of the permits and these Specifications are in conflict, the more stringent requirements shall apply.

1.6 Quality Assurance

A. Contractor personnel shall be persons qualified by education and experience to perform the duties assigned.

B. The Field Team Leader shall be a person qualified and experienced in the work described in these Specifications. STS will provide a Quality Assurance Officer to review all project submittals.

C. All work shall be done according to the requirements of these Specifications.

1.7 Submittals.

All submittals shall be made to the STS or its Agent.

2.0 PRODUCTS

2.1 Backfill Materials

A. General. Fill materials shall be obtained from suitable stockpiles or borrow as defined in these Specifications. Materials containing organic (except topsoil), perishable, spongy, frozen, expansive or other deleterious materials shall not be acceptable.

B. Embedment. Embedment material shall be fine aggregate or sand as defined by Part 2 of Section 02200 of these Specifications.

2.2 Utilities

Materials used to reconstruct utilities shall be as required by the utility company, the governing municipal agency, or the building code.

3.0 EXECUTION

3.1 Location

A. The known locations of utilities shall be identified prior to the start of any excavation. The Contractor shall be responsible for field verifying utility locations and for obtaining any necessary additional information to properly implement and execute the Work Plan.

   1. Known and suspected utilities are shown on the current site survey. The locations as shown may prove to be inaccurate and other obstructions not shown may be encountered. Any reliance on this information will be at the Contractor's risk. The Contractor shall arrange to have all utilities located by the utility companies or a utility location service prior to beginning work (e.g., DIGGER).

   2. Excavations in the areas of suspected underground utilities shall be done in compliance with current regulations for protection of utilities for the City of Chicago.

B. Utility lines and structures which are to remain in service shall be protected by the Contractor from any damage as a result of his operations.

   1. Where utility lines or structures not shown on the site survey are encountered, the Contractor shall report them to STS or its Agent before proceeding with the work.

   2. Unless their excavation is necessary to allow work to proceed or as a result of contamination, the Contractor shall bear the cost of repair or replacement of any marked utility lines or structures which are broken or damaged by his operations.

   3. All repair work, including backfilling, shall be done as required by the governing utility or agency. The Contractor shall contact the governing utility or agency and determine the requirements for properly completing the work.

3.2 Existing Utilities Designated for Excavation

A. Overhead Utilities shall be removed and replaced by the utility if such is necessary for proper completion of the work. If the utility will not or cannot remove them, procedures for excavation will be discussed with and approved by the utility. At a minimum, removal of overhead utilities shall include the following.

   1. Obtain the necessary disconnects and verify the utilities are de-energized and grounded prior to the work.

   2. Remove cables and guy-wires from the utility poles.

   3. Determine if the above- and below-grade sections of the poles are contaminated with radiological materials.

      a. If the above-grade sections are not contaminated and the lower section is, or if the potential for contamination of the below-grade section is unknown, fell above-grade sections of utility poles by sawing or other suitable methods to separate the uncontaminated above-grade sections from the potentially contaminated below-ground section.

b. If both sections are contaminated, the pole may be removed by felling the above-grade part and excavating the below-grade part, or by pulling the pole from the ground with a crane or other equipment.

4. Uncontaminated components of overhead utilities, such as cables, guy-wires, etc., shall be disposed as required by Section 02010 of these Specifications.

5. Contaminated components of overhead utilities shall be removed and processed for loadout and disposal as other contaminated debris (see Section 02010 of these Specifications).

6. Excavated materials shall be handled as required by Subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications.

B. Underground Utilities to be removed may be removed by the utility. At a minimum, the following procedures shall be used.

1.. Obtain the necessary disconnects or shutoffs prior to the work and verify the utility is de-energized, drained, or purged as necessary (lock-out and tag-out procedures properly implemented).

2. Excavate and manage materials to access contaminated utilities or bedding materials as required in Subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications. Monitoring of excavations will be required both on-site and in adjacent rights-of-way.

3. Remove, decontaminate and dispose of contaminated utility materials as required in subparts 3.5, 3.6, 3.8 and 3.9 of Section 02010 of these Specifications.

4. Replace, repair, or abandon the removed utility as directed by these Specifications and the Work Plan, or the utility company or municipal agency having jurisdiction.

a. Replacement or repairs of the utilities shall be in accordance with the requirements of these Specifications or the utility or agency.

b. Abandoned utilities shall be capped as required by Article 3.3 of this section.

3.3 Underground Utilities Encountered During Excavation

A. Damage to utilities shall be repaired under the supervision of the respective utility service or municipal agency having jurisdiction.

B. Abandoned utilities shall be cleaned of all encrusted contamination. Open ends or broken pipes shall be properly capped.

1. At a minimum, capping may be done by crimping, pouring concrete around, or plugging the open end in such a way as to prevent a "least path of resistance" for any future gas leaks.

2. Capping will be done as required by the utility or municipal agency if their requirements exceed those above.

C. Active utilities shall be supported in-place, if suitable, or removed and replaced as necessary to excavate to the depths shown in the Work Plan.

1. Support or removal and replacement shall comply with the more stringent requirements of the affected utility or municipal agency or these Specifications.

2. Utility lines, whether removed or left in-place, shall be cleaned of encrusted contamination as required and described by Section 02010 of these Specifications.

3. Removed utilities shall be managed and disposed as required in Section 02010 for other demolition debris.

3.4 Underground Utility Installations

A. The Contractor shall coordinate interruptions of utility services through STS or its Agent.

B. If utilities are installed after backfilling is complete, all excavations shall be by open cut.

1. The banks of the trenches should be as vertical as possible. Shoring and bracing, as necessary shall be designed by a qualified Professional Engineer competent in soils engineering. The design of shoring and bracing shall be provided to STS or its Agent.

2. If rock is encountered, the base of the trench will be overexcavated at least six inches to allow for placement of bedding material.

C. If utilities are installed before backfilling is completed to final line, elevation and grade, the fill shall be to at least 12 inches above the top of the utility before excavation and placement of the utility is begun.

D. <u>Trench Preparation.</u> The bottom of the trench shall be accurately excavated to line, and graded and shaped to fit the lower one-quarter of the pipe to provide uniform bearing and support for each section; wedging and blocking will not be permitted. If the pipe has bell ends, the trench shall be overexcavated at the joints. If the common fill is granular, the base of the trench shall be scarified to a depth of six inches and recompacted to at least 95% of maximum density at ±2% of optimum moisture (standard proctor, ASTM D698). If the common backfill is not granular in nature, the base of the trench shall be overexcavated six inches and backfilled with granular (embedment) material compacted to at least 95% of maximum density at ±2% of optimum moisture.

E. <u>Utility Embedment.</u> All utility lines except electric lines and irrigation lines two inches or less in diameter shall be embedded in fine aggregate (see Subpart 2.1.13 of this section).

1. Embedment material shall extend a distance equivalent to the utility diameter above, below and to the sides of the utility for utilities greater than six inches in diameter. A six-inch embedment shall be provided for utilities less than or equal to six inches in diameter.

2. Care shall be taken not to disturb either the horizontal or vertical alignment of the utility; embed both sides of the utility simultaneously. If necessary, compact embedment material by hand to avoid displacement and damage to the utility.

F. All utility installations shall be inspected by STS, and by the utility or municipal agency if necessary, at the following times.

1. Before placing embedment material over the utility.

2. Before placing common fill over the embedment material.

G. <u>Compaction</u> of common material over the utility shall be by manually-operated power equipment or by hand until at least 12 inches of fill has been placed over the utility. Damage to the utility by compaction or other causes after proper installation shall be the responsibility of the Contractor.

H. Tests. Testing shall be done on all repaired or replaced systems. Testing may be done by the utility or municipal agency or Contractor. All testing will be done as required by the utility, municipal agency or applicable building code. All testing will be done in the presence of STS, and utility , municipal agency or building inspectors, as necessary.

APPENDIX E

Health and Safety Plan

LAKESHORE EAST

Title: Health and Safety Plan

Revision Number: 1

Date: September 30, 2002 Replaces: June 19, 2002

TABLE OF CONTENTS

TABLES

FIGURES

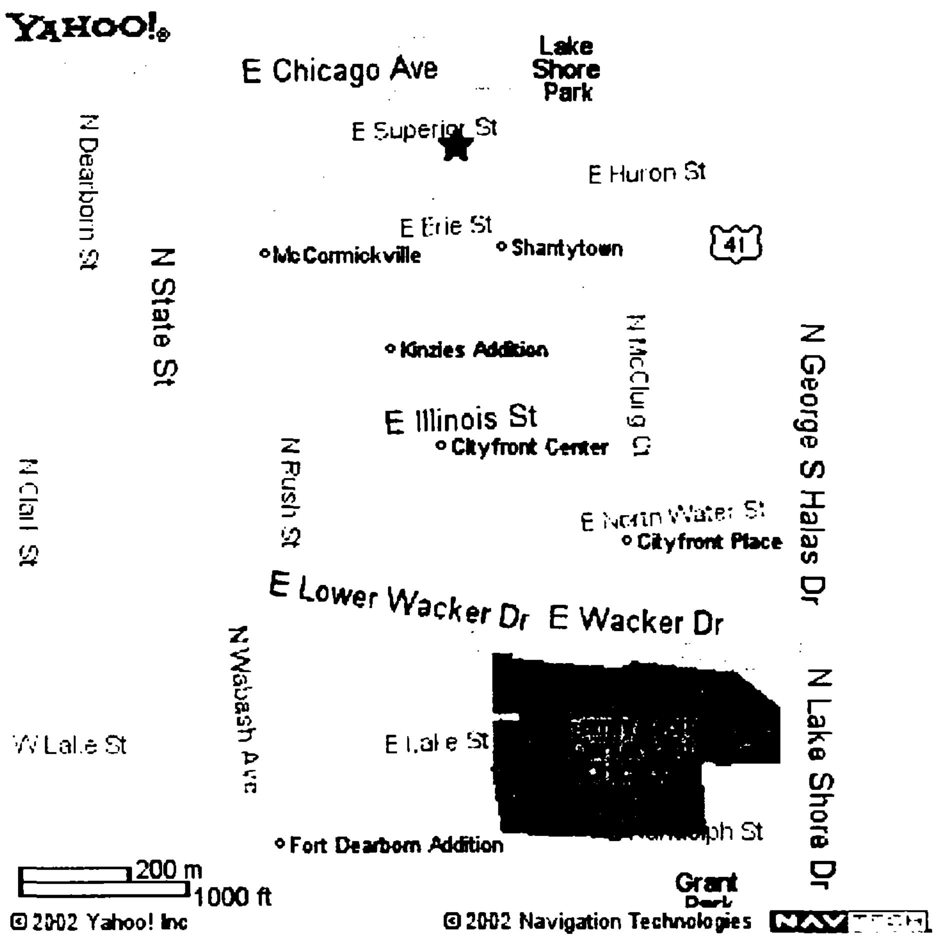
EMERGENCY PHONE NUMBERS

IN THE EVENT OF AN EMERGENCY DIAL 911

AMBULANCE SERVICE	911
FIRE DEPARTMENT	911
EMERGENCY RESCUE SERVICE	911
POLICE DEPARTMENT	911
NATIONAL RESPONSE CENTER	1-800-424-8802
POISON CONTROL CENTER	1-800-732-2200
NORTHWESTERN MEMORIAL HOSPITAL	(312) 908-2000
PROJECT COORDINATOR (Richard Berggreen)	(847) 279-2500
ILLINOIS EMERGENCY MANAGEMENT	(217) 782-7860
USEPA REGION 5 24-HOUR EMERGENCY NUMBER	**(312) 353-2318**
ILLINOIS DEPARTMENT OF NUCLEAR SAFETY (IDNS) EMERGENCY NUMBER	(217) 785-0600 [1]

[1] Primary notification should be made to USEPA Region 5. The IDNS emergency number (217-785-6000) can be used as a secondary notification number.

Hospital Location and Directions



Hospital:
Northwestern Memorial
250 E. Superior Street
Chicago, IL 60611

Directions from Lakeshore Links, 221 N. Columbus Drive

	Miles
1: Start out going North on N LOWER COLUMBUS DR towards N COLUMBUS DR by turning right.	0.12 miles
2: N LOWER COLUMBUS DR becomes N COLUMBUS DR.	0.27 miles
3: N COLUMBUS DR becomes N FAIRBANKS CT.	0.11 miles
4: Turn LEFT onto E ONTARIO ST.	0.12 miles
5: Turn RIGHT onto N ST CLAIR ST.	0.17 miles
6: Turn RIGHT onto E SUPERIOR ST.	0.08 miles

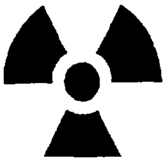
1.0 SCOPE OF PLAN

The following Health and Safety Plan (HASP) will be utilized and modified as necessary in order to minimize and prevent exposures to hazardous substances and conditions related to all excavation and restoration activities at the Lakeshore East Development site (Site). All personnel assigned to this project will be required to review thoroughly the contents of the HASP and to strictly adhere to the policies and procedures listed herein. This HASP is for use only by STS Consultants, Ltd. (STS) as the remediation manager and by their designated contractors and consultants, and approved Site visitors. USEPA, and other agencies, are not considered visitors and will be required to conform to their own Health and Safety Plans.

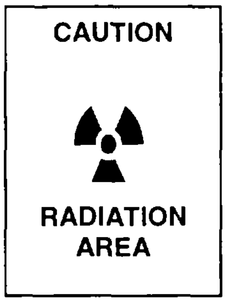
This plan meets the requirements of OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and applicable subparts of OSHA 29 CFR 1926, 1910 and 10 CFR. Visitors will be required to review the health and safety plan and read and sign the visitor information sheet (Figure 1.1).

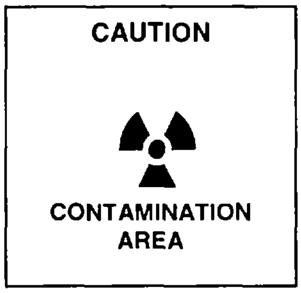
FIGURE 1.1
VISITOR INFORMATION SHEET

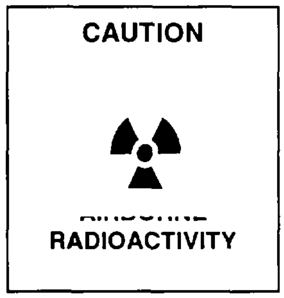
NOTICE TO VISITOR: ALL VISITORS MUST BE ESCORTED AT ALL TIMES WHILE ON THIS SITE.



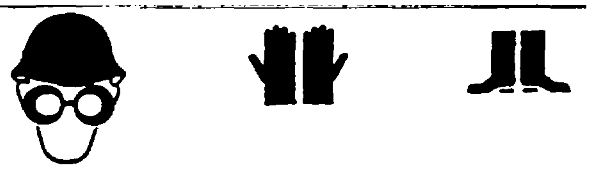
CAUTON. Radioactive materials may be present on this site. Radioactive materials may be found throughout the site. Grounds, and equipment have low levels of contamination.







CONTROLLED AREAS: Do not enter areas with these signs unless you have an escort or health physics has given specific approval and you understand access limitations.



You must wear protective clothing in controlled areas. Health physics will provide you with instructions.

You must wear a personal radiation dosimeter if you enter an area which is controlled.

No smoking, eating, drinking or chewing in controlled areas.
NO EXCEPTIONS.

.Notify Health Physics if you do not understand these instructions.

Signature ______________________ Date ______________

Figure 1.1

2.0 SAFETY MANAGEMENT

The following safety management structure, Figure 2.1, will be utilized for the implementation, administration, and monitoring of the HASP.

2.1 Health and Safety Coordinator

The Health and Safety Coordinator (HSC), Mr. Keith Carlson, shall assume overall responsibility for the HASP. The HSC or designee shall monitor and maintain quality assurance of the HASP until project completion. Principal duties of the HSC include:

- Review project background data,
- Approve all HASP modifications,
- Administer and enforce the HASP,
- Evaluate the adequacy of personal protective equipment (PPE) to be used by Site personnel,
- Conduct required on-site training except tailgate safety meetings that will be conducted by the Field Team Leader (Mr. Dumas Guerrier),
- Brief visitors on work Site conditions, and
- Administer personnel and perform ambient air monitoring procedures.

The HSC or designee has the authority to stop work in the event conditions develop which pose an unreasonable risk to Site personnel or persons in the vicinity.

PROJECT MANAGEMENT ORGANIZATION CHART

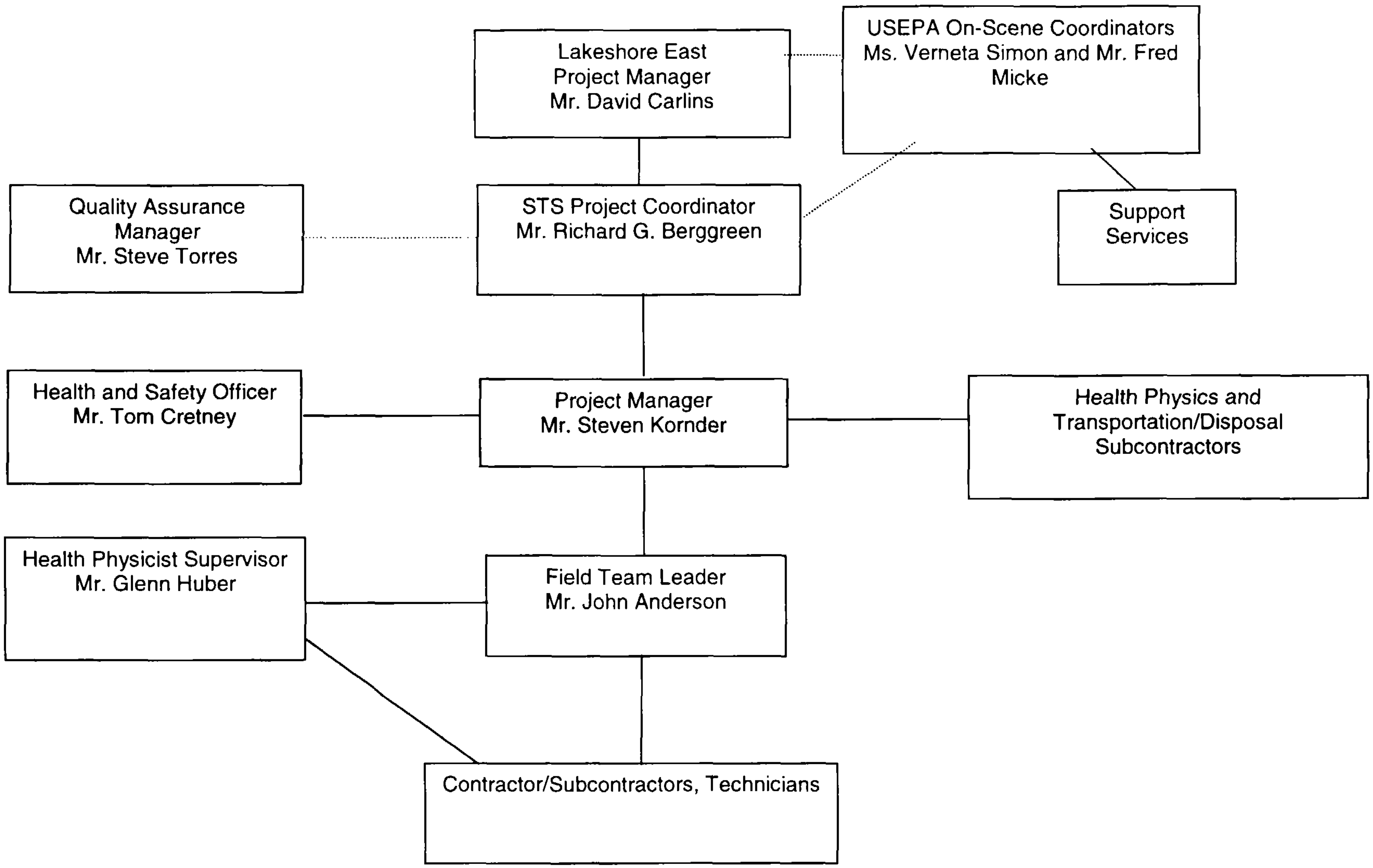


Figure 2.1

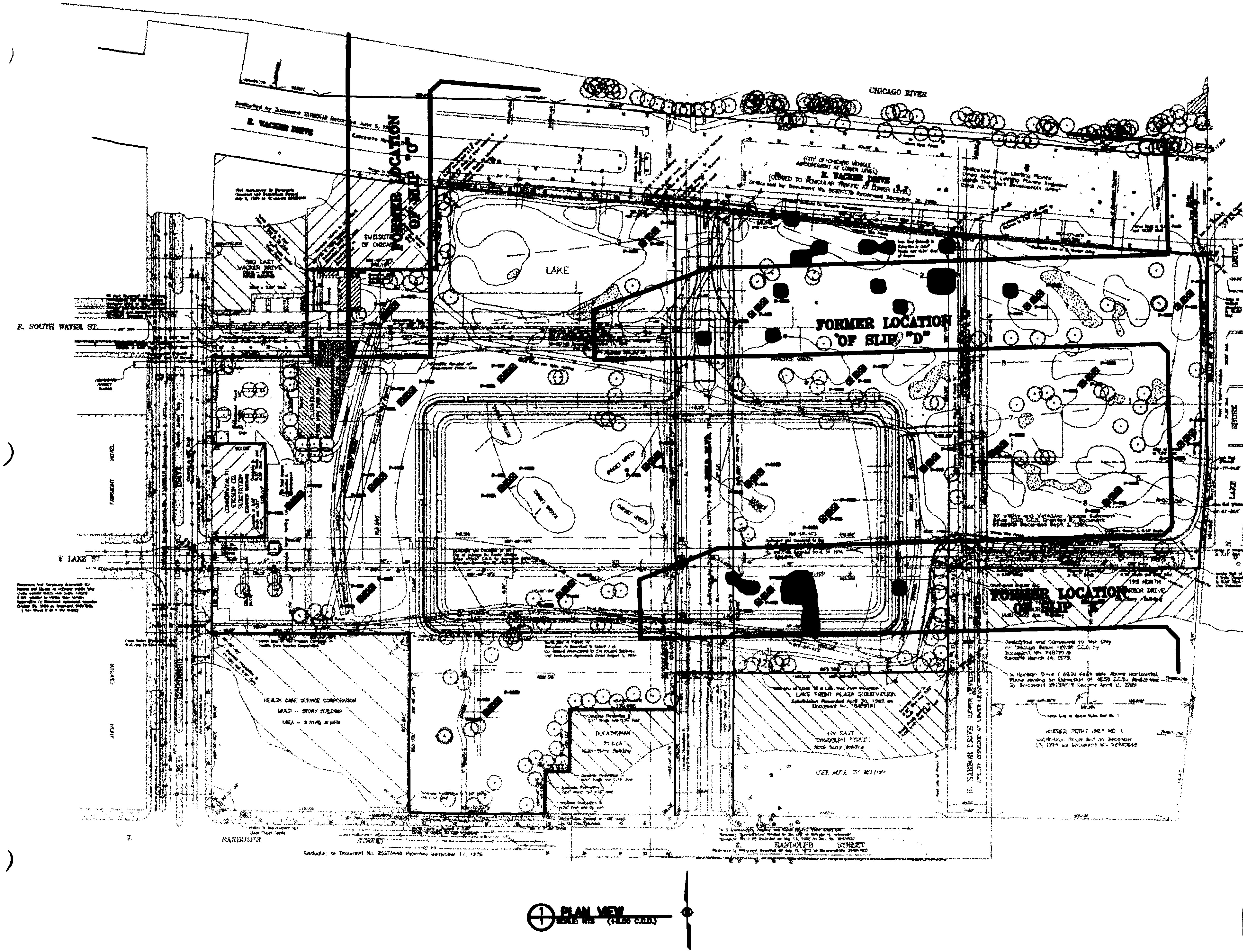
3.0 PERSONNEL RESPONSIBILITIES

The HSC or designee will administer and supervise the HASP at the work-site level. He will monitor all operations and will be the primary on-site contact for health and safety issues, and will have full authority to stop operations if conditions are judged to be hazardous to on-site personnel or the public.

The HSC will brief all Site personnel on the contents of the HASP. Personnel will be required to review the HASP, and have the opportunity to ask questions about the planned work or hazards. The Field Team Leader, Mr. Dumas Guerrier, will conduct tailgate safety meetings to familiarize the Site personnel with Site conditions, boundaries, and physical hazards. Site personnel will conduct their assigned tasks in accordance with the HASP at all times. As necessary, the Field Team Leader will conduct radiation training and provide briefings on radiation issues that arise during construction. These activities will take place as part of the tailgate safety meetings, or during special meetings to address more immediate concerns, dependent on the issues being addressed.

If at any time Site personnel observe unsafe conditions, faulty equipment or other conditions which could jeopardize personnel health and safety, they are required to immediately report their observations to the HSC or Field Team Leader.

Work zones will be established at the Site. These zones include clean/support zones, decontamination zones, and exclusion zones. Known impacted areas where exclusion zones are to be established during the removal effort are shown on Figure 3.1. Although the clean/support zones are anticipated to remain fixed, other zones will move about the Site as excavation work progresses.



LEGEND OF SYMBOLS

- ◆ PROPOSED SOIL BORING
- ◆ PROPOSED SOIL BORING ALTERNATE LOCATION
- ● ELEVATED GAMMA RADIATION AREAS
- STRUCTURAL STEEL COLUMN ON CONCRETE BASE
- METAL LIGHT POLE
- WOVEN WIRE FENCE
- C.C.D. CITY OF CHICAGO ELEVATION DATUM
- MANHOLE
- CATCH BASIN
- CITY ELECTRIC HANDHOLE
- INLET
- LIGHT POLE
- FIRE HYDRANT
- STREET LIGHT CONTROL BOX

NOTE:
ELEVATIONS SHOWN HEREON ARE WITH RESPECT TO CHICAGO CITY DATUM.

SITE PLAN
SHOWING STREETS, UTILITIES AND IDENTIFIED RADIOLOGICALLY IMPACTED LOCATIONS
LAKESHORE EAST
CHICAGO, ILLINOIS

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NUMBER	32163-XA
SCALE	NTS
SHEET NUMBER	3.1

4.0 HAZARD ASSESSMENT

The following represents potential hazards associated with this project.

4.1 Principal Contaminants (Known or Suspected)

Radioactive Contamination

- Thorium: the entire thorium (Th-232) decay chain
- Uranium: the entire uranium (U-238) decay chain
- Radium: Ra-226 and Ra-228
- Radon: Rn-220 and Rn-222

The known total radium concentration present in the soil exceeds 100 pCi/g for some locations within the project site. The following primary routes of entry to the body will be considered:

ROUTE	ENTRY MADE VIA:
Inhalation	Airborne dust containing heavy metal radionuclides and radon.
Ingestion	Airborne dust containing heavy metal radionuclides/contaminants.
	Improper or poor personal hygiene practices.
Eye and Skin	Direct contact with contaminants.
	Improper or poor personal hygiene practices.
	Airborne dust containing heavy metal/radionuclide contaminant.
	Cuts and abrasions.
Direct Exposure	Penetrating gamma radiation in air and soil.
	Exposure to X-rays.

Chemical Contamination

- Polynuclear Aromatic Hydrocarbons (PAHs)

PAH contamination is present in the urban fill materials on site. These materials include coal cinders, ash and fire debris. Typical PAH concentrations are in the low part per million range.

The use of personal protective equipment, proper procedures and dust suppression activities will minimize any hazard to site personnel from either the elevated radioactivity or PAH contamination. Specific safety procedures will be covered in subsequent sections of this Site Safety Plan.

Route	Entry Made Via
Inhalation	Airborne dust
Ingestion	Airborne dust Improper or poor personal hygiene

Skin and Eye	Direct contact with contaminated soil Improper or poor personal hygiene Airborne dust Cuts and abrasions

4.2 Physical Hazards

Before field activities begin, the HSC will conduct a Site reconnaissance to identify any real or potential hazards created from Site activities. Physical hazards inherent to construction activities and power-operated equipment may exist.

4.2.1 Heat Stress

Field activities in hot weather create a potential for heat stress. The warning symptoms of heat stress include fatigue; loss of strength; reduced accuracy, comprehension and retention; and reduced alertness and mental capacity. To prevent heat stress, personnel shall receive adequate water supplies and electrolyte replacement fluids, and maintain scheduled work/rest periods.

The Field Team Leader or designee shall continuously visually monitor personnel for signs of heat stress. In addition, field personnel will be instructed to observe for symptoms of heat stress and methods on how to control it. One or more of the following control measures can be used to help control heat stress.

- Provision of adequate liquids to replace lost body fluids. Employees must replace body fluids lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst, 12 to 16 ounces every half-hour is recommended. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement. Replacement fluids can be commercial mixes such as Gatorade.

- Establishment of a work regimen that will provide adequate rest periods for cooling down. This may require additional shifts of workers.

- Breaks should be taken in a cool and shaded rest area (77 degrees is best).

- Employees shall remove impermeable protective garments during rest periods.

- Employees shall not be assigned other tasks during rest periods.

- All employees shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress.

4.2.2 Cold Stress

Field activities are anticipated during cold weather during a period when temperatures average below freezing. The following guidelines will be followed.

Persons working outdoors in temperatures of 40 degrees and below may suffer from cold exposure. During prolonged outdoor periods with inadequate clothing, effects of cold exposure may even occur at temperatures well above freezing. Cold exposure may cause severe injury by freezing exposed body surfaces (frostbite) or result in profound generalized cooling, possibly causing death. Areas of the body which have high surface area-to-volume ratios such as fingers, toes and ears are the most susceptible to frostbite.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10° F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when external chemical-protective equipment is removed if the clothing underneath is perspiration-soaked.

Local injury resulting from cold is included in the generic term "frostbite". There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incipient frostbite: Characterized by sudden blanching or whitening of skin.
- Superficial frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite: Tissues are cold, pale, and solid; extremely serious injury.

Prevention of frostbite is vital. Keep the extremities warm. Wear insulated clothing as part of one's protective gear during extremely cold conditions. Check for symptoms of frostbite at every break. The onset is painless and gradual - you might not know you have been injured until it is too late.

To administer first aid for frostbite, bring the victim indoors and rewarm the areas quickly in water 95° to 100°F. Give individual a warm drink - not coffee, tea, or alcohol. The victim should not smoke. Keep the frozen parts in warm water or covered with warm clothes for 30 minutes, even though the tissue will be very painful as it thaws; then elevate the injured area and protect it from injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

4.2.3 Electrical Hazards

Overhead power lines, downed electrical wires, buried cables and improper use of electrical extension cords can pose a danger of shock or electrocution. All Site personnel should immediately report to the Field Team Leader any condition that could result in a potential electrical hazard.

The Field Team Leader will notify Site personnel during the safety meetings of the locations of known underground cables and utilities.

4.2.4 Noise Hazard

Operation of equipment may present a noise hazard to workers. Site personnel will utilize hearing protection when noise levels are determined to be in excess of 29 CFR 1910.95 requirements. Noise monitoring will be performed by the HSC as needed.

4.2.5 Overt Chemical Exposure

Typical response procedures include:

SKIN CONTACT:
Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eye wash will be provided on-site at the work zone and support zone as appropriate. If affected, eyes should be continuously flushed for a minimum of 15 minutes.

INHALATION:
Move to fresh air and transport to hospital. Decontaminate as other actions permit.

INGESTION:
Transport to emergency medical facility. Decontaminate as permitted by other requirements.

PUNCTURE WOUND OR LACERATIONS:
Transport to emergency medical facility. Field Team Leader will provide chemical safety information to medical personnel as requested. Decontaminate as permitted by other requirements.

4.2.6 Adverse Weather Conditions

In the event of adverse weather conditions, the Field Team Leader will determine if work can continue without endangering the health and safety of field workers. Some items to be considered before determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions.
- Limited visibility.
- Potential for electrical storms or high winds.

4.3 Medical Evaluation and Surveillance Program

All field project personnel shall receive a medical evaluation in accordance with 29 CFR 1910.120. Personnel who receive a medical evaluation will be notified by the medical contractor as to the outcome of their evaluation. This will be in the form of a confidential report addressed to the individual and will contain a breakdown of the clinical findings. In addition, it will indicate any areas of concern which would justify further medical consultation by the individual's personal physician. In the event that the areas of concern are of a severe nature, a follow-up notification will be made to the individual by the medical consultant to answer any questions the employee may have.

4.3.1 Dosimetry/Personnel Monitoring

All project personnel shall participate in a dosimetry program administered by the HSC. (The dosimetry program shall comply with 32 IAC 340[1] , i.e. dosimeters shall be processed by a dosimetry processor accredited by the National Voluntary Laboratory Accreditation Program.) The HSC shall maintain records of all radiation exposures incurred by field personnel including all contractors. These records will be maintained in an up-to-date manner to comply with the requirements of 32 IAC 340.4010. The HSC shall review the results of personal exposure monitoring to determine compliance with exposure limit requirements.

4.3.2 Requirement for Dosimetry

Personal dosimetry is required for anyone who enters a radiologically controlled area in which he/she may receive in one calendar year a dose in excess of 10% of the limits in 32 IAC 340. Any person who works in a radiation area will be required to have a personal dosimeter. As a matter of policy, all individuals shall be required to use a dosimeter (either self-reading type, film badge, Thermoluminescence Detector (TLD) or Optically Stimulated Luminescence Dosimeter (OSL)) whenever they enter the Exclusion Zone.

4.3.3 Bioassay

Bioassay is the determination of the types and amounts of radioactive materials, which are inside the body. By analyzing the rate of deposition, the rate of excretion, and any other available information regarding placement in the body, internal exposures from radioactive materials can be estimated.

[1] The IDNS regulations are usually more restrictive than US Nuclear Regulatory Commission (NRC) regulations. However, if there is a conflict between IDNS and NRC regulations, the NRC regulations will be used to determine compliance.

Procedures for bioassay will be consistent with the previous Lindsay Light Health and Safety Plan. Bioassays are not anticipated to be required for the excavation and removal activities proposed, based on levels documented as present.

The decision to use bioassay shall be made by the Health and Safety Coordinator. In the event that a worker has an excessive intake or the potential to receive greater than 10% of the Annual Limit on Intake (ALI) , bioassay shall be ordered. Data from Lapel Air Samplers shall be used as a factor in determining whether or not bioassay is warranted. If workers are found to have been present in locations where airborne radioactivity concentrations are found to be greater than 30% of the Derived Air Concentration, bioassay will be considered.

4.3.4 Emergency Medical Treatment

Emergency first aid should be administered on-site as appropriate. The individual should be decontaminated if possible, depending on the severity of the injury, and transported to the nearest medical facility, if needed. Treatment of the injury is of primary concern and decontamination a secondary concern. Levels of radioactive contamination at the Site could be acutely hazardous if decontamination is not undertaken during an emergency situation. The Field Team Leader will complete the appropriate incident report, if warranted. See Section 4.4, Accident and Incident Reporting.

An emergency first-aid station will be established and will include a first-aid kit for onsite emergency first aid.

Provisions for emergency medical treatment shall be integrated with the following guidelines:

- At least one individual qualified to render first aid and Cardiopulmonary Resuscitation (CPR) will be assigned to each shift.
- At least one individual trained in radiation emergency response will be assigned to each shift
- Emergency first aid stations in the immediate work vicinity.
- Conspicuously posted phone numbers and procedures for contacting ambulance services, fire department, police, and medical facilities.
- Maps and directions to medical facilities.
- Conspicuously posted evacuation routes and gathering area locations shall be posted around the Site.

4.4 Accident and Incident Reporting

All accidents, injuries, or incidents will be reported to the HSC. This accident/incident will be reported as soon as possible to the employee's supervisor. An Accident/Incident Form will be completed by the Field Team Leader, and a copy will be forwarded to the STS Project Manager. A copy of the form is shown as Figure 4.1.

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

COMPANY		DATE
INVESTIGATION TEAM		
EMPLOYEE'S NAME & ID		
SEX	AGE	JOB DESCRIPTION
DEPARTMENT & LOCATION		
ACCIDENT DATE & TIME		
DATE & TIME ACCIDENT REPORTED TO SUPERVISOR		
NATURE OF INCIDENT		
NATURE OF INJURY		
REFERRED TO MEDICAL FACILITY/DOCTOR ☐ YES ☐ NO		
EMPLOYEE RETURNED TO WORK ☐ YES DATE/TIME________________ ☐ NO		
☐ INJURED EMPLOYEE INTERVIEW/STATEMENT - ATTACHED		
WITNESSES		
☐ WITNESSES INTERVIEWS/STATEMENTS ATTACHED		
☐ PHOTOGRAPHS OF SITE - ATTACHED		
☐ DIAGRAMS OF SITE - ATTACHED		
EQUIPMENT RECORDS - ATTACHED - REVIEWED	☐ YES	☐ NO
ACCIDENT/EXPOSURE INCIDENT DESCRIPTION		

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION			
DATE & TIME		LOCATION	
EMPLOYEES INVOLVED			
PREVENTIVE ACTION RECOMMENDATIONS			
CORRECTIVE ACTIONS COMPLETED		MANAGER RESPONSIBLE	DATE COMPLETED
EMPLOYEE LOST TIME - TEMPORARY HELP - CLEANUP - REPAIR - DISCUSSION			
ACCIDENT COST ANALYSIS	INVESTIGATION	COMPLIANCE	TOTAL COST
MEDICAL			
PRODUCTION LOSS			
REPORT PREPARED BY		DATE COMPLETED	
SAFETY COMMITTEE REVIEW	☐ YES	☐ NO	
CORRECTIVE ACTION		DATE STARTED	
SAFETY COMMUNICATION NOTICE PREPARED	DATE		
SAFETY DIRECTOR SIGNATURE			

FIGURE 4.1
ACCIDENT/EXPOSURE INVESTIGATION REPORT

ACCIDENT DESCRIPTION	
DATE & TIME	LOCATION
EMPLOYEES INVOLVED	
EMPLOYEE INTERVIEW/STATEMENT - INJURED EMPLOYEE - WITNESS	
EMPLOYEE NAME	
INTERVIEWED BY	

ACCIDENT DIAGRAM/PHOTOGRAPHS

5.0 TRAINING

All Site personnel potentially in contact with impacted soil or who are involved in the excavation and/or loading for transport of radiologically-impacted soil shall be trained and certified in accordance with 29 CFR 1910.120.

5.1 Project- and Site-Specific Training

Prior to project start-up, all assigned personnel shall receive an initial project- and site-specific training session. This training shall include, but not be limited to, the following areas:

- Review of the Health and Safety Plan;
- Review of general radiation principles and compounds;
- Review of applicable radiological chemical and physical hazards;
- PPE levels to be used by Site personnel;
- Site security control;
- Emergency response and evacuation procedures;
- Project communication;
- Required decontamination procedures;
- Prohibited on-site activities;
- Instructions to workers in accordance with 10 CFR 1912; and
- U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Woman Policies (Females).

5.2 Visitor Orientation

All non-essential personnel and visitors who plan to enter the exclusion zone will be briefed on the HASP requirements and 10 CFR 1912 requirements prior to entry with a trained Site escort. In addition, female visitors will be instructed regarding U.S. NRC Regulatory Guide 8.13 and Declared Pregnant Woman Policies.

5.3 Safety Tailgate Meetings

Before the start of the work week, on Monday morning, the Field Team Leader will assemble the Site personnel for a brief safety meeting. Additional meetings will be conducted throughout the week, as needed, to address safety concerns and precautions. The purpose of these meetings will be to discuss project status, problem areas, conditions, safety concerns, PPE levels and to reiterate HASP requirements. The Field Team Leader will complete a Safety Meeting Report (Figure 5.1) to indicate the contents of the meeting and the attendees.

5.4 First Aid

At least one (1) individual, trained and qualified to administer first aid and CPR in accordance with American Red Cross requirements, who is also trained in radiological response, will be present at the Site.

5.5 Safe Work Permit

Site workers in special work conditions such as confined space, hot work, trenching, or other physical hazards, must be skilled at such work and trained to recognize these as special work conditions. Confined space is defined by OSHA 1910.146. Section 13 of this HASP contains further information on the confined space program to be followed.

Figure 5.2 shows the Safe Work Permit to be completed by the HSC and signed by workers for special work conditions.

Figure 5.3 show the issues which will be addressed in the event soil is encountered which exhibits low level contamination. The potential low level contamination includes the presence of possible residual petroleum products from an existing or former underground storage tank or other source of fuel or polynuclear aromatics hydrocarbons (PAHs) contamination, such as tar, cinders, or coal ash.

FIGURE 5.1
SAFETY MEETING REPORT (Page 1 of 2)

<table>
<tr><td rowspan="2">DATE</td><td colspan="2">DURATION OF MEETING</td></tr>
<tr><td>FROM: ☐ A.M. ☐ P.M.</td><td>TO: ☐ A.M. ☐ P.M.</td></tr>
</table>

NUMBER PRESENT	NUMBER ABSENT	MEETING CONDUCTED BY	DID MEETING INCLUDE REQUIRED TRAINING? ☐ YES (DESCRIBE BELOW) ☐ NO

HEALTH AND SAFETY COORDINATOR'S PRESENTATION	DISCUSSION OF SAFE/UNSAFE WORK PRACTICES, MATERIALS, PRECAUTIONS, HAZARDS, EQUIPMENT FAMILIARIZATION, ETC.
SITE WORKER FEEDBACK	COMMENTS, QUESTIONS, COMPLAINTS, ETC.
HEALTH AND SAFETY COORDINATOR'S CORRECTIVE ACTION PLAN	KNOWN PLANS FOR CORRECTION, PARTS ON ORDER, ITEMS TO BE DISCUSSED WITH DEPART. HEAD, AND CORRECTION OF ITEMS PREVIOUSLY SUBMITTED
PROJECT MANAGER'S COMMENTS	RESOLUTION OF QUESTIONS, ITEMS OR ISSUES RAISED IN MEETING OR WITH SUPERVISOR

HEALTH AND SAFETY COORDINATOR	PROJECT MANAGER
FIELD TEAM LEADER	HAVE SITE WORKERS ATTENDING SIGN ON REVERSE SIDE. FORWARD A COPY TO THE PROJECT COORDINATOR

FIGURE 5.1
SAFETY MEETING REPORT (PAGE 2 OF 2)

TO BE SIGNED BY ALL SITE WORKERS ATTENDING THE MEETING			
I HAVE RECEIVED AND UNDERSTAND THE INFORMATION AND/OR TRAINING INDICATED ON THE REVERSE SIDE.			
SIGNATURE	DATE	SIGNATURE	DATE

LIST ALL SITE WORKERS ABSENT FROM THE MEETING	

FIGURE 5.2
SAFE WORK PERMIT (Page 1 of 2)

COMPLETED PERMIT MUST BE POSTED AT THE ENTRY OR WORK SITE.

ISSUED BY	DATE	TIME (FROM) ☐ A.M. ☐ P.M.	TIME (TO) ☐ A.M. ☐ P.M.
ACCEPTED BY	RESPONSIBILITY TRANSFERRED TO (NAME)		
LIST ALL WORKS (ON BACK) OR ATTACH ROSTER			

SECTION 1 — GENERAL AREA WORK PERMIT

1. WORK LIMITED TO THE FOLLOWING: (DESCRIPTION AND AREA/EQUIPMENT)

2. SAFETY EQUIPMENT (OTHER THAN AREA REQUIREMENTS) ☐ NONE

☐ RAIN SUIT	☐ GLOVES	☐ FACE SHIELD	☐ GROUND FAULT CIRCUIT INT.	☐ AIR PACK (SCBA)	☐ FIRE RESISTANT CLOTHING
☐ CHEMICAL SUIT	☐ HEARING PROTECTION	☐ HOOD	☐ BARRICADES/WARNING SIGN	☐ SUPPLIED AIR	☐ LONG SLEEVES
☐ RUBBER BOOTS	☐ CHEMICAL GOGGLES	☐ FALL RESTRAINT DEVICE	☐ COMMUNICATIONS EQPT (EST)	☐ RESPIRATOR	☐ OTHER

3. THE PERSON RECEIVING THE PERMIT VERIFIES THAT ALL WORKERS:

A. HAVE BEEN THROUGH THE SAFETY ORIENTATION	☐ YES	E. KNOW THE LOCATION OF THE PHONE OR INTERCOM	☐ YES
B. UNDERSTAND APPLICABLE HAZCOM AND RADIATION REQUIREMENTS	☐ YES	F. KNOW THE PROCEDURES FOR SAFE JOB COMPLETION	☐ YES
C. HAVE DISCUSSED HAZARDS OF THE JOB AND AREA	☐ YES	G. HAVE INSPECTED ALL TOOLS/EQUIPMENT	☐ YES
D. KNOW THE LOCATION/USE OF SAFETY EQUIPMENT	☐ YES	H. UNDERSTAND THE CLEAN UP REQUIREMENTS	☐ YES

PERMIT RECEIVER INITIALS ____________

4. POTENTIALLY AFFECTED AREA PERSONNEL AND WORKERS NOTIFIED OF WORK TO BE DONE ☐ YES ☐ N/A

5. THE FOLLOWING RESPONSIBILITIES HAVE BEEN COMMUNICATED TO THE PERSON RECEIVING THIS PERMIT:

☐ CONDITIONS FOR WORK STOPPAGE	☐ PERFORMING THE WORK SAFELY	☐ COMPLETION OF SECTION 6 AND PERMIT RETURN
☐ CREW ACCOUNTABILITY	☐ REPORTING CHANGES THAT AFFECT JOB SAFETY	

SECTION 2 — AIR TESTS

PRIOR TO ENTRY OR HOT WORK ☐ DOES NOT APPLY

TEST IN ORDER INDICATED

Test		Reading		Range	Tested By	Location of Test	Time	
1. OXYGEN METER TEST PERFORMED	☐ YES ☐ N/A	READING	$\%O_2$	RANGE 19.5-23.5% O_2	TESTED BY	LOCATION OF TEST	TIME	☐ AM ☐ PM
2. COMBUSTIBLE GASES AND VAPORS TEST	☐ YES ☐ N/A	READING	%LEL	MAXIMUM 10% LEL	TESTED BY	LOCATION OF TEST	TIME	☐ AM ☐ PM
3. TESTS FOR TOXICS	☐ YES ☐ N/A	READING	☐ PPM ☐ MA/M^3	PEL/TLV ☐ PPM ☐ MA/M^3	TESTED BY	LOCATION OF TEST	TIME	☐ AM ☐ PM

SECTION 3 — HOT WORK

☐ DOES NOT APPLY

	YES	N/A		YES	N/A
1. FIRE EXTINGUISHER (TYPE) ______________ IS IT FULL?			8. GROUND LEAD ATTACHED TO WORK		
2. SURVEY AREA FOR COMBUSTIONS AND OPENINGS, HOSES, TRENCHES, ETC.			9. PREVENTION OF HEAT EXPOSURE TO GASKET, SEALS, LINERS		
3. COMBUSTIBLE MATERIALS REMOVED OR PROTECTED			10. OTHER WORK IN AREA WHICH SHOULD BE STOPPED		
4. HEAT/SPARK CONTROL - TARPS, COVERS, WATER, ETC.			11. MATERIAL PRESENT WHICH EMITS VAPOR WHEN HEATED		
5. PRECAUTION TAKEN FOR HIDDEN COMBUSTIBLES			12. RADIANT HEAT TRANSFER CONSIDERED		
6. PURGE GAS USED. TYPE ______________			13. EQUIPMENT OPERATING OR CONTAINS ORIGINAL CONTENTS		
7. ADJACENT AREAS SAFE/SEWERS PROTECTED			14. DUCTS OR CONVEYORS PLUGGES OR PROTECTED		

SECTION 4 — CONFINED SPACE

☐ DOES NOT APPLY

	YES	NO	N/A		YES	NO	N/A
1. CONFINED SPACE ENTRY REQUIRED?				5. HAVE AUTHORIZED ENTRANTS SIGNED OPPOSITE SIDE OF THIS FORM?			
2. SPACE TO BE ENTERED ______________				6. HAVE DESIGNATED ATTENDANTS SIGNED OPPOSITE SIDE OF THIS FORM?			
3. PURPOSE OF ENTRY ______________				7. HAVE ALL NECESSARY HAZARD CONTROL MEASURES BEEN TAKEN?			
4. IS SPACE A PERMIT-ENTRY SPACE? IF YES, COMPLETE OPPOSITE COLUMN				8. HAS ALL REQUIRED EQUIPMENT BEEN PROVIDED?			

SECTION 5 — TRENCHING/EXCAVATION

☐ DOES NOT APPLY

	YES	NO	N/A		YES	NO	N/A
1. HAS THE AREA BEEN INSPECTED FOR UNDERGROUND POWER LINES OR PRODUCT LINES?				4. HAVE PRECAUTIONS BEEN TAKEN IF THE TRENCH/EXCAVATION DEVELOPS INTO A CONFINED SPACE?			
2. DOES THE TRENCH REQUIRE SHORING/BRACING/SUPPORT?				5. HAVE OVERHEAD POWER/PRODUCT LINES BEEN REMOVED OR IDENTIFIED?			
3. HAS THE SOIL BEEN EVALUATED FOR STABILITY?				6. WILL LEAKING WATER OR RAIN WATER AFFECT THE STABILITY OF THE TRENCH/EXCAVATION?			

SAFE WORK PERMIT (Page 2 of 2)

			Yes	No	N/A		Yes	No	N/A
SECTION 6	QUESTIONS TO BE COMPLETED ON PERMIT EXPIRATION OR JOB COMPLETION.	1. HAS THE JOB BEEN COMPLETED?				5. HAVE SAFETY DEVICES BEEN REINSTALLED?			
	WORKER CLOSEOUT SIGNATURE	2. HAS THE AREA BEEN CLEANED OF WORK MATERIAL?				6. HAS HOT WORK AREA BEEN SURVEYED FOR SMOLDERING MATERIALS?			
	TIME ☐ AM ☐ PM	3. HAVE MANAGEMENT PERSONNEL BEEN INFORMED JOB IS DONE?				7. SPECIAL PRECAUTIONS, CONCERNS OR REMARKS			
		4. HAVE ALL LOCKS AND/OR TAGS BEEN REMOVED?				COMMENTS:			

OBSERVERS, WATCHERS, RESCUERS	I HAVE BEEN INSTRUCTED AS A CONFINED SPACE ATTENDANT, SAFETY WATCHER OR RESCUER AND UNDERSTAND MY DUTIES.			
	SIGNATURE	DATE	SIGNATURE	DATE

PERSONS AUTHORIZED TO PERFORM WORK AND/OR TO ENTER CONFINED SPACE	I HAVE BEEN INSTRUCTED IN AND AM AWARE OF THE POSSIBLE HAZARDS AND CONDITIONS I MAY ENCOUNTER IN THIS ENTRY WORK							
	SIGNATURE	TIME		DATE	SIGNATURE	TIME		DATE
		IN	OUT			IN	OUT	

COMMENTS			
AUDIT PURPOSE ONLY			
CORRECTIVE ACTIONS			
COMPLETED BY	NAME	TITLE	DATE

FIGURE 5.3
SITE SAFETY PLAN
LOW CONTAMINATION OF FUEL,
CHLORINATED PESTICIDES AND PNAs IN SOILS

SUMMARY INFORMATION

DATE: ______________________ UPDATE: ______________________

PROJECT NAME: ______________________ PROJECT NO: ______________________

LOCATION: ______________________

SITE CONTACT AND PHONE NUMBER: ______________________

TYPE OF FACILITY: (active or inactive - describe previous use, previous agency action, soil type, topography, surrounding community)

PLAN PREPARED BY: ______________________

SITE SAFETY OFFICER: ______________________ CPR/FIRST AID TRAINED STAFF: __________

REVIEWED BY: ______________________ DATE: ______________________

WORK SCOPE/CONSTRUCTION/INVESTIGATION
Task 1 ______________________
Task 2 ______________________
Task 3 ______________________

PROPOSED START DATE: ______________________

UNUSUAL FEATURES/SITE SECURITY (include site map): ______________________

UTILITIES: ☐ Marked ☐ Scheduled Meet Date __________ Time __________

ANALYTICAL DATA (to be summarized below or attached, if available)

____

____

CONFINED SPACE: ☐ Yes ☐ No (If yes, describe and address permitting and entry procedures in an attachment.) ______________________

____

AIR MONITORING:
Monitoring equipment: HNu meter with 10.2 eV lamp or ______________________
Action level = 15 PID units in breathing zone for Level C upgrade. Stop work = 50 PID units in breathing zone.
☐ O_2 meter, ☐ FID, ☐ Detector tubes, ☐ L.E.L. meter, ☐ Other ______________________

Other action levels: ______________________

PERSONAL PROTECTION: Level of Protection: ☐ A ☐ B ☐ C ☐ D
Special Requirements ____________________

COMMUNICATION EQUIPMENT: (Mobile Phone or other phone location and number, etc.)

____

Scheduled Safety Meetings Interval: (daily, weekly, as needed)

SPECIAL SITE EMERGENCY COMMUNICATION PROCEDURES: (Evacuation signals, routes, spill containment)

HEAT/COLD STRESS CONTROLS:

SPECIAL PHYSICAL HAZARD CONTROLS: Barricades for work area, reflective vests, other, etc.

____

LOCAL EMERGENCY RESOURCES AND TELEPHONE NUMBERS
Emergency Eye Wash/Shower Location:
Fire Extinguisher: ____________________
Police: ____________________
Fire Department: ____________________
Poison Control: ____________________
HOSPITAL: ____________________
Address: ____________________
Telephone: ____________________
Directions (supply map): ____________________

____

EMERGENCY CONTACTS (name and phone number)

1. Construction Manager Contact: ____________________
2. Owner Contact: ____________________
3. Contractor Contact: ____________________
4. Subcontractor Contact: ____________________
5. Subcontractor Contact: ____________________
6. ____________________
7. ____________________

PRE-ENTRY SAFETY BRIEFING

I have received and read the ____________________ Low Contamination Health and Safety Plan. I understand the plan and had the opportunity to ask questions. I understand the information and instructions in the plan. I understand that medicine can complicate the effects from exposure to toxic chemicals. If I am taking any prescription or over the counter medicine or have a current medical condition which may increase my risks, I will advise my supervisor or Site Safety Officer.

Signature	Responsibility	Date

6.0 COMMUNICATIONS

6.1 General Communications

The Field Team Leader will have available at the Site the means for telephone communications, or an equivalent means of communication, for summoning emergency assistance from the fire/ambulance and police departments in the event they are required. The telephone will also act as a direct link to technical personnel for information pertaining to all phases of the project.

6.2 Radio/Telephones

Short-range walkie-talkies or cellular telephones will be made available to designated personnel working at the Site.

6.3 Emergency Warning

In the event of an emergency condition, the Field Team Leader will notify project personnel verbally if all are within immediate hearing and via a bullhorn if the Site area is large. The Field Team Leader will also notify visitors present within the area. Site personnel will immediately proceed to a pre-designated assembly area as designated by the Field Team Leader during the daily safety meeting. Personnel will remain in the designated area until further instructions are received by the Field Team Leader.

All communication equipment will be tested at the beginning of each day to verify operational integrity.

6.4 Hand Signals

Hand signals will be used by field teams in conjunction with the buddy system. Hand signals shall be familiar to the entire field team before operations commence and should be reviewed during site-specific training.

Signal	Meaning
Hand gripping throat	Out of air; can't breathe
Grip partner's wrist	Leave area immediately; no debate
Hands on top of head	Need assistance
Thumbs up	OK; I'm all right; I understand
Thumbs down	No; negative

6.5 Site Security

Only authorized personnel will be permitted on the Site in accordance with the requirements of this HASP. Visitors and other non-essential personnel may enter the work area only upon authorization by the Field Team Leader. This restricted access will ensure that the Field Team Leader can communicate with each person authorized to enter the work area.

7.0 PERSONNEL EXPOSURE AND AIR QUALITY MONITORING

7.1 Air Quality (Dust)

Due to the nature of the principal contaminants associated with the project (radiation and PAHs), dust suppression will be important as a means of minimizing exposure levels and off-site migration of contaminants. A key control measure to minimize exposure levels and off-site migration of contaminants will be a policy of "no visible dust". The Field Team Leader will routinely monitor the project area. Acceptable dust levels (controlling all visible dust) will result in airborne dust levels of less than 1 mg/m^3. The OSHA nuisance dust standard of 15 mg/m^3 is not acceptable at this site, because of contaminants in the dust.

7.2 Airborne Radioactivity Monitoring

Monitoring for airborne radioactivity exposure is as important as monitoring for external radiation exposure. Monitoring for airborne radioactivity exposure requires the following elements:

- Air sampling for radioactive particulates,
- Recordkeeping regarding personnel work locations and time in location,
- Respiratory protective equipment records regarding devices used by workers in airborne radioactivity areas,
- Counting and analyzing air sample filters,
- Calculating air concentrations of radioactive material, and
- Comparing air concentrations to applicable air quality criteria

By closely monitoring these elements, a continuous record of personnel exposure to airborne radioactivity is maintained.

Lapel samplers worn for personal air monitoring shall be utilized for airborne radioactivity monitoring any time a worker enters a radiological exclusion zone. The filters from the lapel samplers shall be analyzed the following day after use for comparison purposes to assess the need for procedural changes. It is expected that naturally occurring radon and thorium daughters will interfere with analyses. Additional evaluation of samples shall be performed when determined necessary based upon elevated results. If sample analysis shows concentrations greater than background levels a follow-up analysis shall be performed. The follow-up analysis shall be performed after four days to allow for the decay of the thoron daughter Pb-212 (10.6 hour half life). The "four day count" should be free from radon daughter interference and will serve as the official measurement of Th-Alpha.

High volume air samplers shall be utilized so that effluent air quality can be gathered on a daily basis. High volume air sampling allows for much shorter collection times than low volume sampling and has equivalent dust loading for needed collection durations. Both high and low volume air samplings require a sufficient volume of air to be collected in order for the Minimum Detectable Activity (MDA) to be below the most restrictive air effluent guidelines. Daily analysis of samples will allow for necessary procedural changes to be made and alert health and safety staff to potential problems on a continuous basis, rather than once per week.

Time decay of interfering nuclides generally refers to radon-222 decay and daughters but may also include thoron decay. The specific times for decay of samples are best addressed in procedures rather than in the health and safety plan.

After filters have been collected and decayed overnight, there will be a morning count of the filter that will serve to identify high gross counts for the previous day. This will alert health and safety staff of a potential problem which they can investigate more promptly. The count, after 4 days decay, will serve to be the official measurement of Th-Alpha.

7.3 Internal Monitoring

Internal monitoring to determine intakes of radioactive material will be performed as needed based upon the results of the air sampling program. Bioassay methods to be considered should include in-vivo, as well as in-vitro, assessments. Routine bioassay of workers is not anticipated based upon the low concentrations of radioactivity in soils to be excavated.

7.4 External Radiation Monitoring

External radiation monitoring of workers will be performed using film badges or thermoluminescent dosimeters. Dosimetry will be provided and processed by a service holding National Voluntary Laboratory Accreditation Program (NVLAP) certification. Pocket dosimeters may also be utilized for visitors and other infrequent personnel requiring access to the Site.

7.5 Radiological Surveys

Radiological surveys will be performed to ensure that radiation levels and contamination levels are within applicable guidelines for workers and the general public. Radiation surveys will be performed using the following instrumentation:

- Ludlum Model 2221 Portable Scaler/Ratemeter with 2"x2" NaI probe (or equivalent). This instrument will be used to conduct surface soil scans. Instrument specific action levels shall be used to determine approximate radiological soil concentrations. Any areas where the count rate is greater than the determined action level shall be considered exclusion zones and marked appropriately.

- Ludlum Model 3 Survey Meter with pancake G-M probe (or equivalent). This instrument will be used to conduct surveillance surveys of both personnel and equipment leaving exclusion zones. The action level for both equipment and personnel surveys is any count rate that exceeds background level. Decontamination procedures detailed in section 9.0 of the HSP will be used when contamination is located.

- Ludlum Model 3 Survey Meter with 1"x1" NaI probe "MicroR meter" (or equivalent) and Eberline Model RO-2 Ion Chamber (or equivalent). These instruments will be used periodically to ensure that dose rates in work areas as well as the Site perimeter are below prescribed levels. The action levels for both on and off site are detailed in Section 7.8 of the HSP in Table 7.1

Airborne radioactivity measurements will be performed as described in the Air Monitoring Plan (Appendix 8 to the Removal Action Work Plan).

7.6 Contamination Monitoring

Samples shall be obtained periodically in work areas to ensure that radioactivity is present at acceptable levels and is prevented from leaving the Site. Decontamination of elevated areas will be performed to maintain contamination at levels that are ALARA.

Before leaving the exclusion zone, Site personnel shall be checked through use of a hand-held frisker to ensure that contamination is not present on skin or clothes. The frisker will be a Ludlum Model 3 survey meter with a pancake G-M probe (or equivalent). The Field Team Leader will be immediately informed regarding any contamination on individuals and will initiate appropriate decontamination techniques. Proper disposition of contaminated personal effects and clothing also will be the responsibility of the Field Team Leader.

7.7 Total Organic Vapor Monitoring

In addition to the radiological contaminants, there is a very slight potential of encountering organic vapors. Thus, no routine screening for organic vapors will be conducted during the removal action. However, if organic odors are encountered during the field work screening for total organic vapors will be conducted with a photoionization detector (PID), or similar type equipment, on a daily basis. The screening will evaluate ambient photoionization volatile organic vapors and some semivolatile organic vapors.

Total organic vapors in ambient air will be obtained periodically with a PID during daily field activities. The PID provides real-time readings of exposure to volatile organics and some semi-volatile organics. Measurements will be made daily, prior to activities, to determine background levels. Monitoring measurements will be taken when:

- operations change,
- work moves to a different portion of the Site, and
- personnel observe contaminated materials.

These screening operations will be used to identify conditions requiring an upgrade to full-face respirators as described in Section 7.8.2.

7.8 Action Levels

7.8.1 Radiological Action Levels

Radiological action levels for on-site workers will be determined by performing surveillance surveys as well as airborne particulate monitoring for the presence of radioactivity. Properly trained Health Physics Technicians will perform radiological monitoring. The radioactive contamination on the Site is particulate and insoluble in water. Therefore, there will be no fixed contamination on the workers. Action levels as determined by radioactive monitoring can be found in Table 7.1.

To avoid the need for upgrade of personal protection equipment due to airborne contamination, engineering controls such as the use of water to minimize dust levels will be implemented as necessary during excavation and restoration activities.

7.8.2 Organic Vapors Action Levels

STS Consultants, Ltd. is taking a conservative approach to organic vapor monitoring at the Site. A PID will be used to periodically monitor for organic vapors or when odors indicated the possibility of organic contamination. Operations will be discontinued if the PID reads 5 ppm or greater above background and the area will be evacuated. The Site Health and Safety Officer will retest the area wearing a full-face respirator. Operations will not resume until the PID reads less than 5 ppm, and remains below 5 ppm.

TABLE 7-1
ACTION LEVELS AS DETERMINED BY RADIOACTIVITY

Note:

Personnel shall not be exposed to airborne radioactivity such that their weekly intake exceeds 12 Derived Air Concentration (DAC)-hours without prior approval of the Field Team Leader or designee.

Level of protection may be increased to Level C (full-face air purifying respirator) when airborne monitoring indicates that contamination levels have reached 30% of the DAC. All assessments shall incorporate ALARA principles. Engineering controls shall be used prior to assignment of respiratory protective equipment.

Signs shall be posted at entrances to areas where airborne radioactivity levels exceed, or have the potential to exceed, 25% of the DAC.

The most restrictive DAC of the nuclides which may be present onsite is Th-232. The DAC for Th-232 Class W is $5x10^{-13}$ uCi/ml. The air effluent limit is $4x10^{-15}$ uCi/ml. Engineering controls will be utilized so that no visible dust is present and airborne radionuclide concentrations will be kept ALARA.

Radiation Type	Action Level	Level of Respiratory Protection/Action
a. Contamination on smear samples of equipment	30 dpm/100 cm^2 gross alpha	Decontamination required prior to release for unrestricted use.
b. Contamination surveys of personnel or equipment	Count rate greater than background levels	Decontamination required prior to leaving exclusion zone.
c. Airborne Radioactivity	30% DAC[c]	Consider Level C (full-face APR) based upon ALARA evaluation. Ensure proper posting. Consider internal monitoring
d. Ambient Gamma (work areas)	5 mrem/hr[d]	Consider procedures for shielding of soils. Ensure proper posting.
e. Ambient Gamma (off-site areas)	2 mrem/hr[e]	Implement immediate controls to reduce dose equivalent rate.

Notes

(c) Potential Airborne Radioactivity Area as defined in 10 CFR 20. Workers with 1000 DAC-hours per year to date must wear modified Level C (full-face APR) until the end of the calendar year.

(d) The ambient gamma dose equivalent rate action level of 5 mrem/hr stems, from the 10 CFR 20 radiation area definition. If the ambient gamma dose equivalent rate reaches 2 mrem/hr, one or more of the following actions will be implemented: The source may be shielded; the working distance from the source may be increased; or the worker's exposure time may be limited.

(e) The ambient gamma action level for off-site is based upon the 10 CFR 20 requirements to maintain dose equivalent rates in unrestricted areas such that they do not exceed 0.002 rem in any one hour.

8.0 PERSONAL PROTECTIVE EQUIPMENT

It is anticipated that most excavation activities in designated exclusion zones can be conducted in Level D personal protective equipment (PPE), with a contingency upgrade to Level C, based on the action levels listed in Section 7. Level C will be used when required by Special Work Permits, or when directed by the Field Team Leader.

Level D personal protective clothing and equipment for excavation activities includes:

- Coveralls, disposable or washable through a contaminated clothing vendor. Coveralls are to be removed at the boundary of the exclusion zone.
- Hard hat
- Steel toed boots and chemically resistant booties (exclusion zone)
- Cotton or leather gloves (no soil contact); Nitrile gloves (Edmont 37-15 or equivalent) 0.40 mm thickness to be used if hand contact with soils is probable.
- Safety glasses
- Dust mask (optional)

Level C protective clothing and equipment includes:

- Full-face air-purifying respirator (NIOSH/MSHA approved) fitted with radionuclides/HEPA cartridges and/or organic vapor cartridges, depending on which action levels are exceeded (see Section 7 of this HASP)
- Coveralls
- Tyvek coveralls - required in areas when splashing by contaminated soils or water is a possibility
- Nitrile gloves (Edmond 37-15 or equivalent) 0.40 mm thickness
- Disposable latex inner gloves - required in areas when splashing by contaminated soils or water is a possibility
- Nitrile outer gloves (taped) - required in areas when splashing by contaminated soils or water is a possibility
- Steel toe boots with outer chemically resistant booties (taped)
- Hard hat

Action levels used to determine the need to upgrade or downgrade the levels of protection are described in Section 7 of this HASP.

9.0 CONTAMINATION REDUCTION PROCEDURES

9.1 Equipment

Portable equipment will be decontaminated with soap and water and rinsed with tap water. Heavy equipment will be steam-cleaned with water and, if necessary, a detergent solution.

9.2 Personnel

If levels of radioactivity show that individuals can remove coveralls and other personal protective clothing and equipment before leaving the exclusion zone and, thus complete decontamination, the individuals may leave the exclusion zone. If, however, levels of radioactivity show that individuals cannot achieve decontamination by the removal of coveralls and showering is required, they will be dressed in clean coveralls, boots and gloves and be transported to Northwestern Memorial Hospital to complete decontamination.

If substantial skin contamination occurs on an individual working with radioactive materials, the following specific procedures should be followed to prevent fixation of the material in the skin or absorption of the radioactivity through the skin.

Immediate Action: Notify the HSC or Field Team Leader, who will supervise the decontamination. If contamination is spotty, the HSC or Field Team Leader will supervise the cleaning of the individual spots with swabs, soap, or water. If the contamination is general, the HSC or Field Team Leader may recommend washing the area gently in warm or cool water (not hot) using hand soap (not detergent) for one minute. Rinse, dry, and monitor for radioactivity. This soap wash step may be repeated three times.

Evaluation: If the above procedure fails to remove all the skin contamination, the treatment should cease. An evaluation of the skin contamination should be performed by the HSC or Field Team Leader including an estimate of the dose commitment to the skin, and the quantity and identity of the nuclides contaminating the skin If additional decontamination steps are necessary, they are performed and documented by the HSC. The guidelines for Personnel Decontamination in the Radiological Health Handbook, HEW 1970, beginning on page 194, can be used as applicable. **CAUTION**: Do not use chemicals for personnel decontamination until full evaluation of the contamination is made by the HSC or Field Team Leader.

9.3 Contamination Prevention

Work practices that minimize the spread of contamination will reduce worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

- knowing the limitations of all personal protective equipment being used
- avoiding walking through areas of obvious or known contamination
- refraining from handling or touching contaminated materials directly. Do not sit or lean on potentially contaminated surfaces
- ensuring personal protective equipment has no cuts or tears prior to donning
- fastening all closures on suits, covering with tape if necessary
- taking steps to protect against any skin injuries
- staying upwind of airborne contaminants

- When working in contaminated areas, refraining from eating, chewing gum, smoking, or engaging in any activity from which contaminated materials may be ingested

9.4 Disposal Procedures

All discarded materials, waste materials, or other field equipment and supplies should be handled in such a way as to preclude the spread of contamination, creating a sanitary hazard, or causing litter to be left on-site. All potentially contaminated waste materials (e.g., clothing, gloves) shall be monitored and segregated in accordance with monitoring results into either radioactive or non-radioactive waste. Appropriate labels shall be affixed to all containers of radioactive materials.

10.0 GENERAL WORK PRECAUTIONS

10.1 General Work Precautions

The following general work precautions apply to all Site personnel.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in the work area.
- Hands and face must be thoroughly washed upon leaving the work area. Wash water will be provided at the Site for this purpose.
- Whenever levels of radioactivity warrant, the entire body should be thoroughly washed, as soon as possible, after the protective coveralls and other clothing are removed as part of the decontamination process.
- No facial hair that interferes with a satisfactory fit of the mask-to-face-seal is allowed on personnel required to wear respirators.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, discolored surfaces, kneel on ground, lean, sit, or place equipment on drums, containers, or the ground.
- Medicine, drugs and alcohol may interfere with or impair judgment and reaction times. Therefore, usage of prescribed drugs must be specifically approved by a qualified physician and made known to the Field Team Leader prior to an individuals' presence on the work-site. Alcoholic beverage intake is strictly prohibited at the Site and prior to work.
- All personnel must be familiar with standard operating procedures and any additional instructions and information contained in the HASP.
- All personnel must adhere to the requirements of the HASP.
- Contact lenses are not permitted when respiratory protection is required or where the possibility of a splash exists.
- Personnel must be cognizant of symptoms for radiological exposure onsite, for heat stress and cold stress, and knowledgeable regarding emergency measures contained in the Emergency Contingency Plan.
- Respirators shall be cleaned and disinfected after each day's use or more often, if necessary.
- Prior to donning, respirators shall be inspected for worn or deteriorated parts. Emergency respirators or self-contained devices will be inspected at least once a month and after each use.
- Each employee shall be familiar with the project's Respiratory Protection Program.

10.2 Operational Precautions

The following operational precautions must be observed at all times.

- All Site personnel shall be adequately trained and thoroughly briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures, and communications.

- All required respiratory protective devices and clothing shall be worn by all personnel going into areas designated for wearing protective equipment.

- All Site personnel shall use the buddy system when wearing respiratory protective equipment. At a minimum, a third person, suitably equipped as a safety backup, is required during extremely hazardous entries.

- During continual operations, on-site workers act as a safety backup to each other. Off-site personnel provide emergency assistance.

- Personnel should practice any unfamiliar operations prior to undertaking the actual procedure.

- Entrance and exit locations shall be designated and emergency escape routes delineated. Warning signals for Site evacuation must be established.

- Personnel and equipment in the contaminated. work area should be minimized, consistent with effective Site operations.

- Work areas for various operational activities shall be established.

- Procedures for leaving a contaminated area shall be planned and implemented prior to going on-site. Work areas and decontamination procedures shall be established based on expected Site conditions.

- Frequent and regular inspection of Site operations will be conducted to ensure compliance with the HASP. If any changes in operation occur, the HASP will be modified to reflect those changes.

11.0 SANITARY FACILITIES

11.1 Potable Water

a. An adequate supply of potable drinking water shall be maintained at all times immediately outside the Site. Drinking water shall meet all federal, state and local health requirements.
b. Drinking water shall be supplied to project personnel via approved dispensing sources.
c. Paper cups shall be permitted for the drinking of potable water supplies.
d. Drinking water dispensers shall be clearly marked and shall, in no way, have the potential for contamination from non-potable supplies.
e. Site personnel must be fully decontaminated prior to approaching the drinking water supply.

11.2 Toilet Facilities

a. Adequate toilet facilities shall be provided at the Site.
b. These facilities shall be in the form of portable chemical toilets.
c. Routine servicing and cleaning of the toilets should be established with the selected contractor and shall be in accordance with federal, state, and local health regulations.
d. Site, personnel must be fully decontaminated prior to approaching the toilet facilities.

11.3 Washing Areas

a. Adequate washing areas shall be provided for personal use within the work area.
b. Washing areas shall be maintained in a sanitary condition and will be provided with adequate supplies of soap, towels for drying, and covered waste receptacles.
c. Washing areas shall be maintained and sanitized daily.
d. No eating, drinking or smoking shall be permitted in the work area. This policy will be strictly enforced by the Field Team Leader.

12.0 FIRE CONTROL EQUIPMENT

An adequate number of approved portable fire extinguishers (class rated A, B and C) shall be readily available at the Site at all times.

All Site personnel shall be trained in the use of the extinguishers. Extinguishers shall only be used on outbreak stage fires or fires of minor nature. The local fire department shall be contacted in the event of a larger fire and Site evacuation procedures should be commenced in accordance with the procedures described in the Emergency Contingency Plan.

13.0 CONFINED SPACE PROGRAM

13.1 Purpose

In the event that confined space work is a necessity, a Confined Space Program will be implemented. Training in the recognition of confined spaces is a component of the health and safety training program.

The purpose of the Confined Space Program is to establish procedures to protect personnel from this serious hazard in the course of their work; and at a minimum, to comply with 29 CFR OSHA 1910.146. This document assigns responsibilities and sets standards for personnel engaged in activities where confined spaces may be present.

13.2 Responsibilities

13.2.1 Health and Safety Coordinator

The Health and Safety Coordinator administers the Confined Space Program. The Health and Safety Coordinator's responsibilities include:

- Review of the HASP for potential confined space hazards and design alternative approaches to accomplish the confined space tasks;
- Coordinating and managing the Confined Space Program in the event one is required;
- Establishing priorities for implementation of the program;
- Assisting with recognition and implementation of the Confined Space Program;
- Advising project management on confined space issues; and
- Communicating the Confined Space Program to personnel by training related to specific Site activities.

13.2.2 Project Manager

The Project Manager directs the application of the Confined Space Program to project work. The Project Manager is responsible for:

- Working with the Health and Safety Coordinator to prepare information describing activities that might be conducted in a confined space area;
- Assuring that all personnel engaged in project activities are familiar with the definition of a confined space;
- Assuring that personnel are familiar with the Confined Space Program, and that project activities are conducted in compliance with the Confined Space Program;
- Assuming the responsibilities of the Field Team Leader if another person is not assigned these responsibilities.

13.2.3 Field Team Leader

The Field Team Leader is responsible for the implementation of the Confined Space Program on-site during field activities. The Field Team Leader is responsible for:

- Overseeing implementation of the Confined Space Program during field operations; and

- Reporting confined space work activity, and any violations of the Confined Space Program, to the Project Manager and the Health and Safety Coordinator.

13.2.4 Personnel

Personnel are responsible for:

- Familiarizing themselves with the Confined Space Program and following it;

- Becoming familiar with the criteria for determining a confined space, and with the monitoring, permitting, and other requirements of the program; and

- Reporting immediately a confined space condition to the Field Team Leader.

13.3 Definition of a Confined Space

Confined space means a space that:

1. Is large enough and so configured that an employee can bodily enter and perform assigned work

2. Has limited or restricted means for entry or exit (such as pits, storage bins, hoppers, crawl spaces, and storm cellar areas)

3. Is not designed for continuous employee occupancy

Any workspace meeting all of these criteria is a confined space and the Confined Space Program must be followed.

13.4 Confined Space Entry Procedures

13.4.1 Safety Work Permit Required

All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. The Safe Work Permit for entry into a confined space must be completed before work begins; it verifies completion of the items necessary for confined space entry. The Permit will be kept at the Site for the duration of the confined space work. If there is an interruption of work, or the alarm conditions change, a new Permit must be obtained before work begins.

A permit is not required when the space can be maintained for safe entry by 100% fresh air mechanical ventilation. This must be documented and approved by the Health and Safety Coordinator. Mechanical ventilation systems, where applicable, shall be set at 100% fresh air.

The Field Team Leader must certify that all hazards have been eliminated on the Entry Permit. If conditions change, a new permit is required.

13.4.2 Pre-entry Testing for Potential Hazards

a. Surveillance

Personnel first will survey the surrounding area to assure the absence of hazards such as contaminated water, soil, or sediment, barrels, tanks, or piping where vapors may drift into the confined space.

b. Testing

No personnel will enter a confined space if any one. of these conditions exists during pre-entry testing. Determinations will be made for the following conditions:

1. Presence of toxic gases or dusts: Equal to or more than 5 parts per million (ppm) on the organic vapor analyzer with an alarm, above background outside the confined space area; or other action levels for specific gases, vapors, or dusts as specified in the Health and Safety Plan and the Confined Space Permit based on knowledge of Site constituents;

2. Presence of explosive/flammable gases: Equal to or greater than 10% of the Lower Explosive Limit (LEL) as measured with a combustible gas indicator or similar instrument (with an alarm); and

3. Oxygen Deficiency: A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume as measured with an oxygen meter.

Pre-entry test results will be recorded and kept at the Site for the duration of the job by the Field Team Leader. Affected personnel can review the test results.

c. Authorization

Only the Field Team Leader and the Health and Safety Coordinator can authorize any personnel to enter into a confined space. This is reflected on the Safe Work Permit for entry into a confined space. The Field Team Leader must assure that conditions in the confined space meet permit requirements before authorizing entry.,

d. Safe Work Permit

A Safe Work Permit for confined space entry must be filled out by the Health and Safety Coordinator or Field Team Leader. A copy of the Safe Work Permit is included as Figure 5.2.

e. Attendants

One worker will stand by outside the confined space ready to give assistance in the case of an emergency. Under no circumstances will the standby worker enter the confined space or leave the standby position. There shall be at least one other worker not in the confined space within sight or call of the standby worker.

f. Observation and Communication

Communications between standby worker and entrant(s) shall be maintained at all times. Methods of communication that may be specified in the Safe Work Permit and the HASP may include voice, voice by powered radio, tapping or rapping codes, signaling tugs on rope, and standby worker's observations that activity appears normal.

13.4.3 Rescue Procedures

Acceptable rescue procedures include entry by a team of rescuers only if the appropriate self-contained breathing apparatus (SCBA) is available; or use of public emergency services.

The standby worker must be trained in first aid, CPR, and respirator use. A first aid kit should be on hand and ready for emergency use. The standby worker must be trained in rescue procedures. Retrieval of an unconscious victim in a confined space will only be conducted by trained rescue personnel. An emergency call to 911 will be initiated to assist the victim.

13.5 Training

Personnel who will engage in field activities will be given annual training on the requirements and responsibilities in the Confined Space Program and on OSHA 1910.146. Only trained personnel can work in confined spaces. Workers should be experienced in the tasks to be performed, instructed in proper use of respirators, lifelines and other equipment, and practice emergency procedures and self-rescue.

Before each Site activity, the determination of confined space work will be part of the Site characterization process. Training in the site-specific confined space activities will be part of the site-specific health and safety training:

13.6 Safe Work Practices

- Warning signs should be posted. These include warnings for entry permits, respirator use, prohibition of hot work and emergency procedures and phone numbers.

- Cylinders containing oxygen, acetylene or other fuel such as gasoline must be removed a safe distance from the confined space work area.

- Purging and ventilating is done before work begins to remove hazardous vapors from the space. The space should be monitored to ensure that the gas used to purge the space (e.g. tank) has also been removed. Local exhaust should be used where general exhaust is not practical.

- The buddy system is used at all times. A standby person always must be posted within sight of, or in communication with, the person inside the confined space. The standby should not enter the confined space, but instead will call for help in an emergency and not leave the post. Communication should be maintained at all times with workers inside the confined space.

- *Emergency planning in the HASP and a Safe Work Permit must be approved in advance and the* proper rescue equipment must be immediately available.

14.0 ELECTRICAL LOCKOUT/TAGOUT

The Field Team Leader must approve all work in areas requiring lockout/tagout procedures. Specific procedures and permitting requirements will be specified in the HASP, or in a revised HASP based on the need for a worker to work around electrical equipment.

All systems must be locked out and tagged before the work begins. This includes pipes, air lines, electrical equipment and mechanical devices. The equipment must be start tested and approved for use by a worker by the Health and Safety Coordinator or the Field Team Leader by start-testing to make sure the locked-out equipment does not operate.

APPENDIX E

STS Consultants Radiological Investigation Reports

Radiation Survey
Addendum to Report for Results of Expanded Gamma Radiation Survey
Test Pit Exploration
Final Report for the Lakeshore East Additional Radiation Survey Investigation

Radiation Survey

STS CONSULTANTS

CONSULTING ENGINEERS

Radiation Survey
26-Acre Site
Southwest Corner of Wacker Drive
and Lake Shore Drive
Chicago, Illinois

1-32193-XH
September 19, 2001

September 19, 2001

Mr. James Loewenberg
Loewenberg and Associates
1 West Superior Street
Chicago, Illinois 60610

Illinois Center Plaza Venture
An Illinois Limited Partnership
c/o Melvin Lippe
Altheimer & Gray
10 South Wacker Drive
Chicago, Illinois 60606-7482

RE: Radiation Survey, 26-Acre Site, Southwest Corner Wacker Drive and Lake Shore Drive, 221 North Columbus Drive, Chicago, Illinois - STS Project No. 1-321693-XH

Dear Mr. Loewenberg and Mr. Lippe:

Enclosed please find the final report for the above-referenced investigation. The findings of this report were communicated in a conference call Monday, August 20, 2001. A draft of the text was provided Wednesday, September 5, 2001.

We appreciate being of service on this very interesting project. Please contact us with any questions you may have regarding this report.

Regards,

STS CONSULTANTS, LTD.

Stephen G. Torres, C.P.G.
Science Group Manager

Richard G. Berggreen, C.P.G.
Principal Geologist

Attachment

RADIATION SURVEY
26-ACRE SITE, SOUTHWEST CORNER OF WACKER DRIVE AND LAKE SHORE DRIVE CHICAGO, ILLINOIS

TABLE OF CONTENTS

RADIATION SURVEY
26-ACRE SITE, SOUTHWEST CORNER
OF WACKER DRIVE AND LAKE SHORE DRIVE
CHICAGO, ILLINOIS

1.0 INTRODUCTION

STS Consultants, Ltd. (STS) conducted an investigation for radiologically-impacted soil on the subject site during July and August 2001. The subject site consists of approximately 26 acres located at the southwest corner of Wacker Drive and Lake Shore Drive at 221 North Columbus Drive, Chicago, Illinois (Figure 1). The site is currently developed as Family Golf Centers at Chicago Metro, a golf course and driving range, with associated support buildings, facilities and parking lots.

Several properties north of the Chicago River in the Streeterville neighborhood have been found to exhibit evidence of radiological impacts (herein referred to as "contamination") from the former processing of thorium-bearing mineral sands by Lindsay Light and Chemical Company during the 1910s, 20s and 30s. The contamination consists of elevated concentrations of thorium, uranium and their radioactive decay products. Several of those properties required removal of the impacted soils. The U.S. Environmental Protection Agency (USEPA) requested access and conducted a reconnaissance survey of a portion of the subject site. That survey identified two locations where the gamma radiation levels were anomalously high. Field analysis by USEPA using a portable multi-channel analyzer in areas exhibiting elevated gamma radiation identified uranium and thorium radionuclides consistent with the other Streeterville properties (USEPA correspondence, July 2, 2001). STS was contracted to investigate the entire 26-acre site to evaluate whether additional locations exhibiting contamination might be present, and to attempt to validate the USEPA survey results.

This investigation did not seek to determine whether the impacted soil would require removal or could remain in place. If concurrence can be obtained from USEPA and other appropriate regulatory agencies that no significant risk to public health or the environment results from leaving the material in place, it may not require removal.

2.0 OBJECTIVES

The objectives of the radiological site investigation reported herein are two fold. First, an evaluation of the locations and apparent volume of impacted soil was to be made. The site was to be surveyed to identify locations that show evidence of anomalously high gamma radiation in a surface survey. Those locations were to be surveyed through downhole gamma logging methods to assess the vertical extent of the identified contamination and develop an estimate of the volume of contaminated soil. Second, a cost estimate was to be developed for possible remedial measures. For this report, the only remedial measure considered was excavation of soil and disposal at a licensed low-level radioactive materials disposal site. Other options for leaving material on-site would require USEPA concurrence. Certain assumptions were made in both the volume estimate and in the cost estimate. Those assumptions, and to the extent possible, the related cost implications for those assumptions are included in this report.

3.0 SCOPE OF WORK

The investigation of the 26-acre subject site consisted of three principal tasks.

- A surface survey of the entire site was conducted on a 5-meter grid.
- Borings were advanced on and in the vicinity of anomalous radiation readings.
- Soil samples were collected and submitted for laboratory analyses.

The following sections describe these tasks in detail.

Task 1 - Surface Gamma Survey

A gamma radiation survey of the site was conducted on a 5-meter grid (5 X 5 meter cell size). The grid was established by measuring along the site margins and establishing two lines crossing the site from north to south and east to west. Cells were designated using an alphabetic designation in the north-south direction and numeric designations in the east-west direction. The grid stations along the site margins and the lines crossing the site were marked with survey flagging tape on the perimeter fence and survey wire pin flags within the center of the site. The grid intersections were painted on the ground.

The survey was conducted using a Ludlum 2221 rater-scaler and a 2 X 2 NaI gamma probe. The probe was unshielded to provide for maximum sensitivity in the survey mode. The probe was carried immediately above the ground surface. Each cell was walked at approximately 1 meter per second or slower while sweeping the probe over the ground surface to measure the gamma radiation within each cell. The maximum gamma reading in counts per minute (CPM) for each cell was recorded.

Cells occupied by standing water were not surveyed since standing water can serve as a barrier to gamma radiation in the subsurface (The lake on-site occupied 116 cells; other standing water covered 10 cells. The entire survey consisted of more than 3,800 cells).

Cells crossed by fences along the site margins were surveyed only within the site property line. Cells crossed by fences within the site were surveyed on both sides of the fence and the higher reading was recorded.

Three separate survey crews collected the surface gamma data. The instruments used by the three teams were calibrated against the same set of standards and minor variations are present in their readings. However, the values for the three instruments are sufficiently close to each other so as to not significantly influence the identification of anomalous gamma radiation locations.

An attempt was made to collect the location data using Global Positioning System (GPS) data. However, the close proximity to numerous tall buildings prevented obtaining the GPS unit from making contact with the required number of system satellites. As a result, all data were collected and recorded manually. A total of approximately 3,870 cells were surveyed for gamma radiation. The maximum value measured in each cell is shown on the spreadsheet covering the site, presented in Appendix A.

The surface gamma survey identified two general areas that exhibited elevated gamma readings. The two general areas were comprised of several smaller subareas or discrete spots. The general areas and the component sub-areas and spots are shown on Figure 2.

Elevated gamma readings are defined as readings that exceed the general background values by a factor of two or more. The readings were also compared to the gamma measurements indicative of an exceedance of the cleanup level established by the USEPA for the Streeterville sites. That cleanup level is 7.1 picocuries per gram (pCi/g) total radium (Ra-226 plus Ra-228) and is indicated by gamma counts for the instruments used (unshielded) of approximately 20,000 CPM.

Task 2 - Soil Borings and Down-hole Gamma Logging

The locations identified as exhibiting elevated gamma radiation were subsequently explored through soil borings and down-hole gamma logging. This subsurface exploration provided for assessing the vertical extent of the anomaly noted in the surface survey. Additionally, the borings provided soil samples that could be submitted for laboratory analyses (Task 3).

Borings were drilled with a truck-mounted drill rig at the locations of the anomalous gamma readings. The borings were restricted to a maximum of depth 12 feet due to permit requirements within the city of Chicago for borings deeper than 12 feet. The borings were continuously sampled using solid flight augers. Borehole size was 4-inch diameter. Upon completion of the boring and sampling, a 3-inch diameter PVC casing with an end cap was inserted into the boring to minimize potential for collapse or cave-in of the boring and to protect the down-hole survey equipment from ground water encountered in some of the boreholes.

In addition to the borings drilled on the locations where anomalous gamma readings were measured, step-out borings were drilled around the initial boring locations. These step-out borings were drilled to assess the apparent horizontal extent of the anomaly in the subsurface, if present. Step-out borings were drilled around the anomalies showing the highest values, the largest areal extent and at locations where access was not restricted by subsurface interference such as utilities.

Locations of the boreholes had to be cleared by the golf facility operators, due to the presence of the irrigation system and other subsurface utilities. Additionally, access to some locations was restricted to prevent damage to the tees and greens by the truck-mounted drill rig. At those locations, attempts were made to advance borings by hand.

However, the presence of rubble fill in the subsurface precluded the use of the hand sampling technique.

A total of 35 borings were drilled, 16 in the southern area on the driving range portion of the site, and 19 in the northern area on the golf course portion of the site. Figures 3A and 3B show the boring locations.

Down-hole gamma logging was conducted in all borings using a Ludlum 2221 rater-scaler and 2 X 2 NaI probe. Gamma measurements were taken in 6-inch increments for the full depth of the boring. Measurements were taken in counts per 30 seconds and were compared to the threshold for the cleanup level established by USEPA for other contaminated sites in the area.

The downhole gamma logging is relatively sensitive to radioactive material in the vicinity of the borings, in that the detector may be surrounded by the material and as a result may detect gamma radiation from a large volume of material. Additionally, the detector may receive radiation from material above or below the interval being measured. This influence from material above or below the interval being measured is referred to as "shine". Where "shine" occurs, readings may appear to exceed the cleanup threshold while the actual soil at that depth does not exceed the threshold. The possibility for "shine" was considered in the calculated volume estimates and is discussed in the assumptions.

The downhole survey is limited to evaluating the soil in the immediate vicinity of the borehole. Soil provides an effective shield for gamma radiation, and gamma radiation is effectively blocked by soil more than about 2 feet thick. Therefore, it must be recognized that the survey instruments, in either the surface survey or the downhole survey, generally will not see evidence of thorium-impacted soil buried more than 2 feet deep nor more than 2 feet radius distance from the borehole.

The downhole gamma surveys found evidence of elevated gamma readings in 13 of the 35 boreholes surveyed. The thickness of the impacted zone, not accounting for "shine", ranged from less than 1 foot to greater than 10 feet. Many of the borings, 10 of 13, showed elevated gamma readings in the upper 2 feet. Appendix B presents the downhole gamma survey results.

Task 3 - Gamma Spectroscopic Analysis of Soil Samples

Soil samples were collected continuously from the borings drilled in Task 2. The samples to be submitted for laboratory analyses were selected on the basis of the downhole gamma survey results. Two samples were generally selected from each boring to assess the vertical extent of the impacted interval.

The samples were placed in 500-milliliter Marinelli beakers, specifically designed for high resolution gamma spectroscopy analysis. The material submitted for analysis was from the suspect interval; however, the sample may not contain the radioactive material, if the gamma radiation detected in the downhole survey was from immediately adjacent to the borehole, but not within the sampled material. As a result, where the downhole survey shows evidence of elevated gamma radiation but the laboratory results do not, it is likely there is radioactive material present in the subsurface that was not intercepted and sampled in the boring.

A total of 50 soil samples were recovered and submitted for analysis. Additionally, one surface sample from the upper 1 foot of soil at one location was collected where a borehole could not be drilled. Of those 51 samples, 7 showed radionuclide concentrations that exceeded the USEPA established cleanup levels. The detections correlated to the boreholes where elevated downhole gamma measurements were noted, and the highest gamma readings correlated to the highest analytical results. Laboratory and test results are presented in Appendix C.

The radionuclides of principal interest are those indicative of the radium concentrations, as these are the concentrations used for comparison to the USEPA-specified cleanup criteria. The USEPA criteria is 7.1 pCi/g of total radium, radium-226 plus radium-228. Lead-214 (Pb-214) is the surrogate used to quantify radium-226 (Ra-226), in the uranium decay chain. Actinium-228 (Ac-228) is the surrogate used to quantify radium-228 (Ra-228), in the thorium decay chain. The Streeterville materials typically have a thorium to uranium ratio of around 4 to 1. Most of the samples that showed levels above the cleanup criteria had thorium:uranium ratios similar to the materials which required removal from the Streeterville sites north of the Chicago River.

4.0 SUMMARY OF FINDINGS

Two general areas were identified as exhibiting elevated gamma readings in the surface walkover survey. These areas are shown on Figure 2 and generally include the locations that the USEPA identified as exhibiting elevated gamma readings.

Downhole gamma survey results show from 1 foot to more than 10 feet of impacted soil. The majority of the downhole results show the impacted material to be relatively shallow. Some intervals with elevated gamma readings are at depths which would not be evident from surface surveys.

Gamma spectroscopy laboratory results show exceedances of the cleanup criteria established by USEPA. The radionuclides present appear typical of Streeterville materials in terms of the specific isotopes present and the ratios between the various radionuclides.

4.1 Soil Volume Estimates

The volume estimates contained herein are based primarily on the surface surveys and downhole gamma results. Laboratory data did not materially influence the volume calculations. In order to be conservative in the volume estimates, that is in order to not under-estimate the volumes, "shine", the influence of impacted material on clean soil wherein the clean soil may appear impacted, was not used to reduce the apparent impacted thickness.

The following assumptions were used in developing the calculated volumes. These assumptions are intended to err on the conservative side, in order to reduce the potential to underestimate the volume of impacted soil.

1. If a 5 X 5 meter cell shows evidence of radiological impacts in the surface survey but no downhole data are available, a minimum of 1 foot of soil is assumed to be removed

from that cell. A 1-foot thickness of soil within a 5 X 5 meter cell equals approximately 10 cubic yards (c.y.).

2. Where adjacent borings show different depths of radiological impacts, the greater depth was given greater weighting in predicting the depth of remediation.

3. Where no horizontal limit is established by borings, the radiologically impacted material is assumed to extend half into the adjacent cell. Estimates of area underlain by impacted soil are made by adding the approximate fractions of adjacent cells and rounding to the next largest whole number.

4. Based on the volume of material evident in surface and subsurface survey results, it is anticipated the material to be removed will be approximately twice the measured volume. This factor of two represents the experience that there is at least the amount for which you have found evidence, and usually more.

5. At the request of the clients' representatives, a contingency estimate was developed. This contingency estimate was to predict maximum amount of material that might need to be removed. It should be recognized, however, that there is no guarantee intended in this maximum estimate. That contingency is recommended to be an additional factor of 2.

The volume estimates based on these assumptions are presented on Table 1. The identified volume is approximately 1,000 c.y. The anticipated volume given the likelihood of encountering more material than was identified is 2,000 c.y. The contingency estimate based on the maximum "outside" limit might be as high as 4,000 c.y., but includes a factor of 4 beyond the identified volume.

These volume estimates are based on the identified locations where material exceeding the cleanup criteria was encountered. Inasmuch as there will be construction excavations and site grading over most if not all of the subject site, and given that the shielding provided by soil could mask other areas from detection, if monitoring of excavation spoil is conducted in the course of construction, additional radiologically impacted areas may be identified. There is not sufficient information to provide an estimate of what volumes of impacted material might be encountered in the course of construction, if monitoring were to be conducted.

Note also that if permission is obtained to leave material on-site where risks to health and safety are acceptable, the material requiring removal would be accordingly reduced. USEPA and other regulatory agency approval would be required for this option to be considered.

4.2 Remediation Cost Estimates

The cost of remediating the identified contamination is based on experience with several vicinity remediation projects and certain assumptions as to material transportation and disposal. Those assumptions are summarized below.

1. On the previously completed removal projects from the Streeterville area north of the Chicago River, one of the responsible parties held a permit for disposal of the thorium-impacted soil. That permit was for disposal at a facility in Utah, which is one of the only facilities permitted to accept these low-level radioactive materials for disposal. In developing these costs, it was assumed that the work to be completed for this site would use that permit rather than attempting to obtain a new permit.

2. Transport to the disposal facility in Utah would be in intermodal containers, shipped by truck from the site to a rail yard in Blue Island and then by rail to Utah.

3. The cost for the transport and disposal on the previous projects was not disclosed, and we understand the cost information is proprietary based on the large volume of material shipped and disposed by the permit holder. However, a general estimate of $10,000 per shipping container was reported anecdotally and is used herein for transport and disposal of a 10 c.y. container. This provides for a cost of $1,000 per yard for transport and disposal if the material can be handled under the existing permit. Increased costs would likely be incurred if a new permit were to be required.

4. The excavation of the material may be included in part of the construction costs or may be separate from that work. The excavations may require certain engineering involvement to conduct the work in accordance with standard practices, and to maintain safe working and construction procedures. Monitoring radiation levels in the excavation will be required to confirm the limits of the cleanup. Air quality monitoring will be required to document that fugitive dust has not transported radioactive soil off site. A Work Plan and Health and Safety Plan will likely be required by the USEPA for the management of the removal effort. Laboratory testing and documentation will be necessary to confirm the removal complies with the cleanup standard. A closure report

will likely be required to provide a permanent record of the work completed, and to seek USEPA concurrence with the work. These management and documentation efforts may reach 25 percent of the transportation and disposal cost. The percentage becomes lower with larger quantities and may be higher for smaller quantities due to economies of scale. For this project and the 2,000 to 4,000 c.y. estimate, however, the 25 percent approximation appears appropriate.

These assumptions and approximations indicate that the removal and disposal of approximately 1,000 c.y. of radiologically impacted soil, if no more is found than was initially estimated, would cost $1,000,000 for transport and disposal, and $250,000 to $300,000 for excavation, management, engineering and documentation. Under the contingency volume estimate where a factor of 4 is applied to the identified soil volume, the transportation and disposal cost estimate maximum may be $4,000,000 and excavation, management, etc., could be $1,000,000 for the 4,000 c.y. estimate.

5.0 CONCLUSIONS

STS conducted an investigation of radiologically impacted soil at the 26-acre subject site located in Chicago, Illinois. This investigation included a gamma survey of 3,870 5 x 5 meter cells that identified eight anomalies. Downhole gamma measurements were recorded in 35 soil borings at the site.

- Based upon the results of the surface and downhole surveys, STS identified approximately 1,000 c. y. of soil that warrant excavation and disposal. A contingency estimate of the maximum volume includes a factor of 4, increasing the estimate to 4,000 c.y.

- Based upon our experience performing similar work in the area, STS estimates that cleanup costs at the site will range from $1,250,000 to the contingency maximum of $5,000,000.

TABLE 1
SOIL REMOVAL VOLUME CALCULATION

Southern Area

Area *	Boring Number	Depth/Thickness (feet)	Open **	Number of Grids	Depth (feet)	Volume/ Cubic Yards
G-51	B-3, -4, -5	10', 2', 6'	E, NW	5	6 - 8'	300 @ 6' 400 @ 8'
I-52	B-4A, -8, -8A	4 - 5', 2 - 5', 1'	NE, W	3	3 - 5'	90@ 3' 150 @ 5'
H-46	None	None Detected	All	2	Assume 1'	20
D-52.5	B-6, -7	None Detected	All	2	Assume 1'	20
						470 - 590

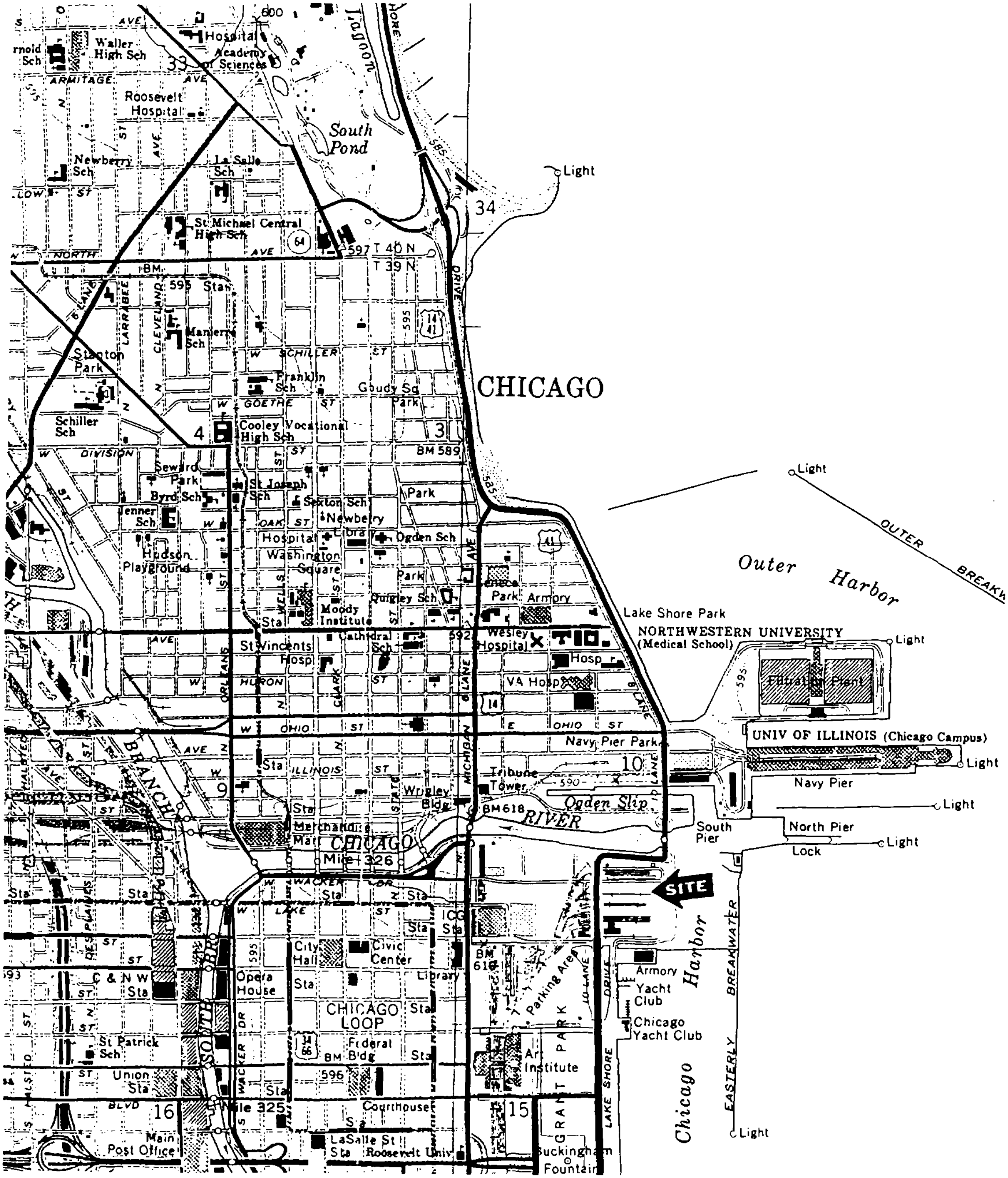
Northern Area

Area *	Boring Number	Depth/Thickness (feet)	Open **	Number of Grids	Depth (feet)	Volume/ Cubic Yards
OO.51	B-19, -19A, -19E	5', 6', 4'	--	3	6'	180
SS-50.5	B-18	1'	S	1	1'	10
PP-67	13-A	2'	N, E	2	2'	40
MM-66	12,12-A	2'	All Sides	5	2'	100
PP-59	None	None Detected	All	6	1'	60
MM-59	None	None Detected	All	3	1'	30
						430

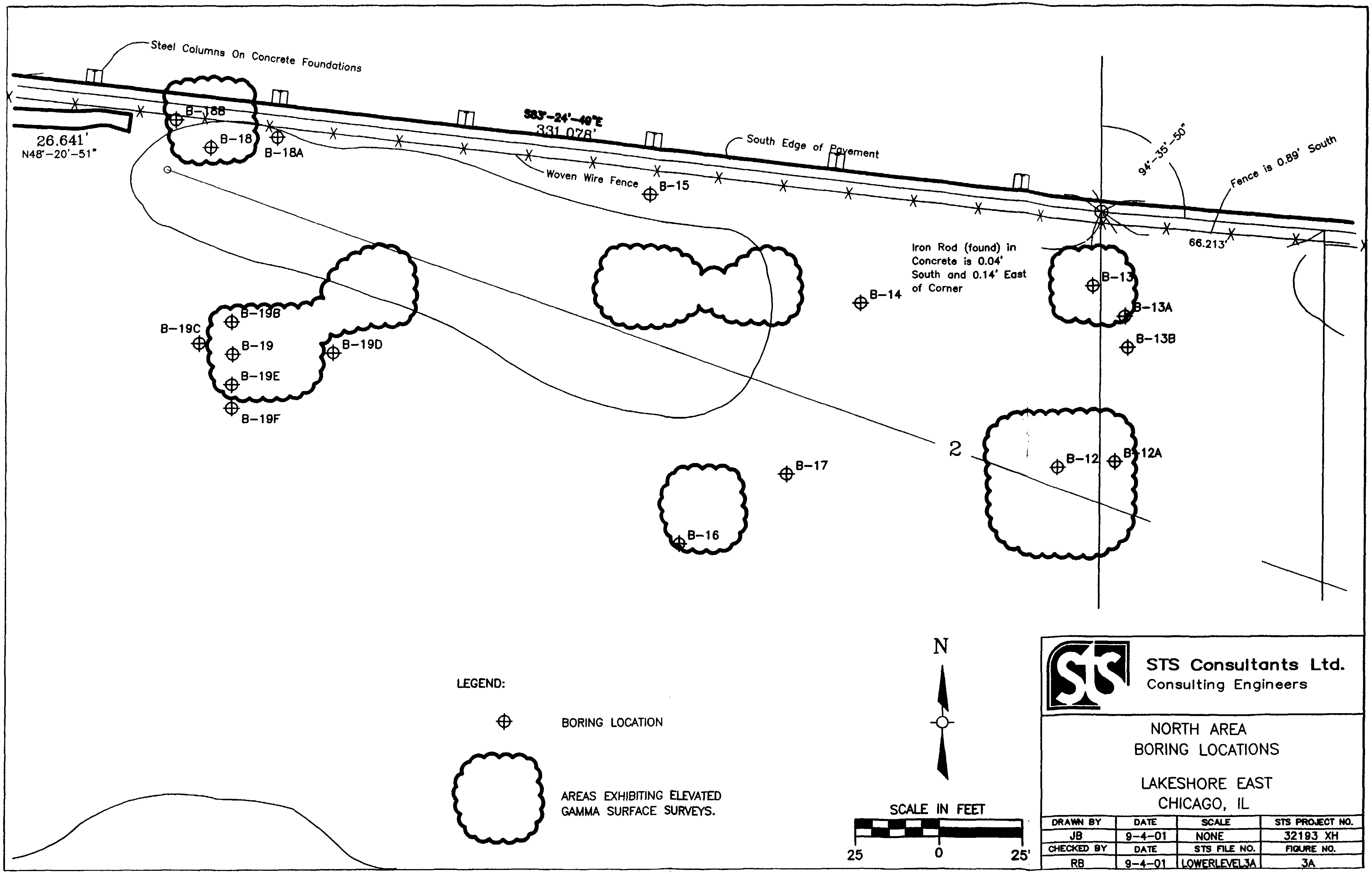
Total 900 - 1,020 cubic yards - assume 1,000 cubic yards

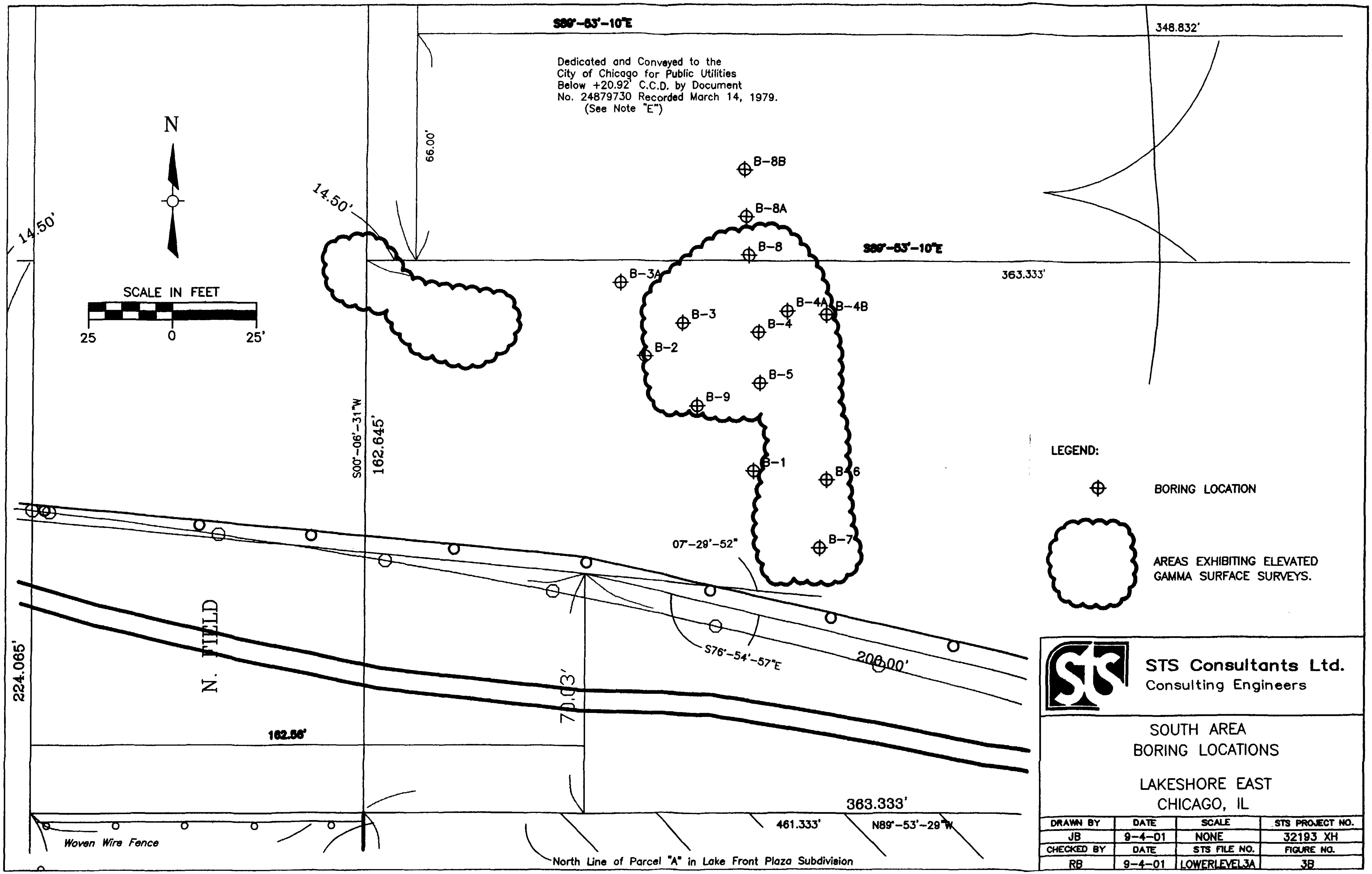
* Area approximately centered at this location

** Open refers to directions where no borings are present to define the limits of extent of contamination.

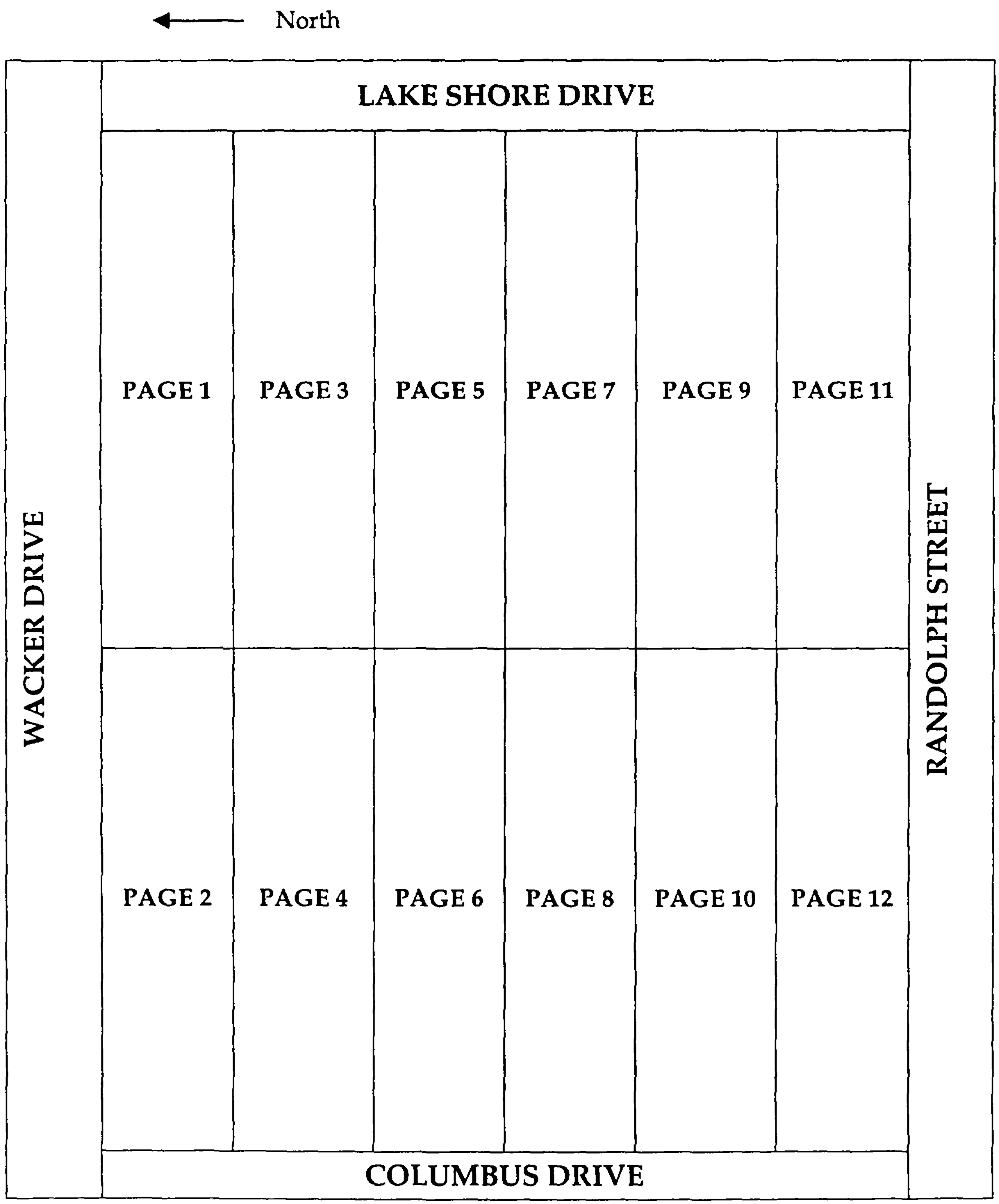


STS Consultants, Ltd.	Figure 1 Site Location Map Lakeshore East Radiation Survey STS Project No. 1-32193-XH	Date of Map: 1963 Approximate Scale: 1:24,000


Steel Columns On Concrete Foundations
26.641'
N48°-20'-51"
B-18B
B-18
B-18A
S83°-24'-49"E
331.078'
South Edge of Pavement
Woven Wire Fence
B-15
94°-35'-50"
Fence is 0.89' South
66.213'
Iron Rod (found) in Concrete is 0.04' South and 0.14' East of Corner
B-14
B-13
B-13A
B-13B
B-19B
B-19C
B-19
B-19D
B-19E
B-19F
2
B-17
B-12
B-12A
B-16
LEGEND:
BORING LOCATION
AREAS EXHIBITING ELEVATED GAMMA SURFACE SURVEYS.
N
SCALE IN FEET
25
0
25'
STS Consultants Ltd.
Consulting Engineers
NORTH AREA
BORING LOCATIONS
LAKESHORE EAST
CHICAGO, IL
DRAWN BY
JB
DATE
9-4-01
SCALE
NONE
STS PROJECT NO.
32193 XH
CHECKED BY
RB
DATE
9-4-01
STS FILE NO.
LOWERLEVEL3A
FIGURE NO.
3A


S89°-53'-10"E
348.832'
Dedicated and Conveyed to the
City of Chicago for Public Utilities
Below +20.92' C.C.D. by Document
No. 24879730 Recorded March 14, 1979.
(See Note "E")
N
66.00'
14.50'
14.50'
SCALE IN FEET
25
0
25'
B-8B
B-8A
B-8
S89°-53'-10"E
363.333'
B-3A
B-4A
B-4B
B-3
B-4
B-2
B-5
B-9
S00°-06'-31"W
162.645'
B-1
B-6
B-7
07°-29'-52"
LEGEND:
BORING LOCATION
AREAS EXHIBITING ELEVATED GAMMA SURFACE SURVEYS.
224.065'
N. FIELD
70.03'
S76°-54'-57"E
200.00'
162.56'
363.333'
461.333'
N89°-53'-29"W
Woven Wire Fence
North Line of Parcel "A" in Lake Front Plaza Subdivision
STS Consultants Ltd.
Consulting Engineers
SOUTH AREA
BORING LOCATIONS
LAKESHORE EAST
CHICAGO, IL
DRAWN BY
JB
DATE
9-4-01
SCALE
NONE
STS PROJECT NO.
32193 XH
CHECKED BY
RB
DATE
9-4-01
STS FILE NO.
LOWERLEVEL3A
FIGURE NO.
3B

LAYOUT OF GAMMA SURVEY DATA SPREADSHEETS



Gamma Survey Spreadsheet

WW	VV	UU	TT	SS	RR	QQ	PP	OO	NN	MM	LL
93											
92							7600	7700	6400	6200	6400
91							7700	7600	6300	7000	6400
90							7300	7800	6100	5600	6800
89							7800	8100	7900	7900	7800
88							7600	7700	7700	7900	7700
87							7500	7800	8300	8400	7400
86							7700	8000	6900	5800	5400
85						7600	7800	7900	7900	5500	5300
84						7100	7900	7200	6500	5300	5200
83						7600	7700	7400	5400	5200	7100
82						7000	7600	7500	5800	6000	7100
81						7200	7300	7400	6800	6600	6500
80						7200	7300	7200	6300	6500	6800
79						7100	7600	7200	6900	7000	7800
78						7600	7400	7100	7000	7200	8100
77						7600	8000	6800	6800	7800	8400
76						7600	7400	6800	6200	7200	7900
75						7900	7200	7100	8100	8000	6300
74						7600	7800	7700	8500	8100	7600
73						7600	7700	7400	6100	7200	8200
72						7600	7600	7400	7500	8100	7800
71						7500	7500	7300	8300	7700	7100
70					7200	7600	7400	7600	8100	7100	6800
69					7300	7400	7100	7800	8000	6400	6900
68					6400	7200	7600	7400	7200	6800	8400
67					6600	7900	8600	7700	7200	11,000	10200
66					6800	7800	244000	7700	11500	180000	180000
65					6900	7400	7600	7800	13000	180000	180000
64					7500	8200	7300	8400	10600	13400	13500
63					7400	8000	8100	9400	9300	9600	9500
62					7400	11000	8300	9000	9400	9000	9500
61					7700	8100	8300	8600	8700	10100	8900
60					8100	7200	70000	17400	7400	9300	9400
59					7300	6800	7000	7000	7300	8400	32800
58				5900	8200	6900	375000	7300	6700	9600	14100
57				6300	8100	6400	6600	7400	8800	10100	9800
56				6900	7200	6700	6300	9200	9700	10300	9000
55				6400	7300	6600	8500	9400	9300	9400	9900
54				7300	7400	6600	6500	9900	9600	9300	9600
53				7400	7100	7700	24000	10100	10500	9700	10000
52				6600	6100	6000	10100	10200	10600	10000	9900
51				6700	6200	6700	8200	73000	10500	9200	9600
50				63500	6200	6000	8100	9300	9900	9500	10800
49			5300	7300	7600	7800	7900	9400	10300	12800	
48			5100	6400	7600	7600	8400	8300	9400	18200	15300
47			5800	6800	7300	7200	7700	8700	9100	10300	9500
46			6000	6900	6400	6800	7600	9400	9300	9000	8600
45			5900	6500	6900	5900	6800	7200	7800	7600	8800
44			5900	7200	7100	6800	6400	7500	7100	7600	8400
43			5300	6100	6700	6800	6600	7400	6900	7400	8200
42			6200	7300	6200	7000	6700	6800	6700	7500	8300
41			6500	7200	6400	6300	7400	7300	7800	6600	8200
40			6800	5900	6100	6100	7300	7600	8300	7600	7200
39			7000	5900	6300	6400	7600	7500	7600	8000	8100
38		4800	7300	5200	6300	6100	7700	8400	8300	8000	8800
37		4700	7400	6400	5800	7300	7700	8200	8000	8400	8100
36		5100	7800	7900	7900	8400	9600	9600	9300	8200	8500
35		5300	7100	6800	6800	6900	9200	8300	9100	8700	8200
34		7200	6400	5200	5400	7400			7100	8200	7800
33		8300	7600	5700	6100	7600				7800	7600

Gamma Survey Spreadsheet

32		7700	8000	7500	7400	10000				6800	7000
31		7200	8000	7300	7700	10100					6300
30		6200	5700	5100	7900						
29		7200	6300	5300	7800						
28		7500	6800	7400	8200						
27	7000	8200	7600	8700							
26	6700	8000	8100								
25	7200	7600	8000								
24	7000	7700	7800								
23	7500	7800				6000	7100	6100			
22	6800	7600			6200	5900	5800	5600	7200		
21	7600	7500			5900	5700	5800	6000	5500	5600	
20	7400	7800			6000	6000	5700	5900	5700	5600	
19	7900	7900			5900	5800	5600	5800	6000		
18	9100	7700				6200	6200	6000	5800		
17	11000	7600					8000	7400			
16	13200	8100	9600				7900	8200			
15	12200	8700	8100	8300	7300	8000	7100	8300	8600		9600
14	8150	8400	8600	8500	7400	10000	8600	8900	8600	9200	9400
13											
12											
11											
10											
9											
8											
7											
6											
5											
4											
3											
2											
1											
WW	VV	UU	TT	SS	RR	QQ	PP	OO	NN	MM	LL

Gamma Survey Spreadsheet

WW	KK	JJ	II	HH	GG	FF	EE	DD	CC	BB	AA
93											
92	6300	7600	7200	7100	7200	6800	7100	7000	7300	7100	7000
91	6500	6100	6000	6200	6300	5800	6200	6400	5700	6500	6700
90	5700	6100	6200	6600	6500	7300	6300	6000	5900	6300	6400
89	7600	7300	7400	7400	7500	7100	7600	6900	7000	8200	8400
88	8200	8100	8100	8200	7900	7100	7800	8000	8100	9000	7800
87	7200	7800	7200	7600	7700	10300	7700	8400	8100	8900	9100
86	5500	8000	7900	7600	9800	10600	8200	7600	7200	7900	8800
85	5500	7700	8000	8600	8100	8900	6700	7900	8300	7900	7600
84	8400	7900	7800	7300	7700	7800	6300	5800	7400	8700	8100
83	8900	7700	8200	8300	8700	8300	5400	6100	8200	8100	8800
82	8900	8300	8400	8700	8600	9200	6400	6300	7800	8400	7900
81	7400	7800	8200	8000	8200	9100	6200	6500	8000	7700	6100
80	8500	7800	8300	8200	8600	9200	7400	5600	7800	7200	5600
79	8300	8100	8200	8400	8100	8700	6300	5800	7800	7300	5600
78	8700	8000	8300	8300	8400	9100	7800	6100	6600	7200	6700
77	8800	8100	8000	8700	9200	8600	8100	6100	6700	6900	7200
76	6200	6300	6600	7800	8000	8600	8100	6400	6900	7000	6900
75	6200	6300	6800	7400	7700	8700	8400	6800	6700	7200	6900
74	5600	6000	6100	7800	8600	8900	8700	7600	6800	6700	6600
73	7600	6800	7100	8600	9400	10000	8500	8400	6300	6800	7600
72	7200	6800	7100	8200	8100	9200	8500	8000	6900	7000	7400
71	7100	7400	7700	7800	7900	8700	8900	7600	8200	6400	7400
70	8600	7600	8000	8200	8300	8100	7900	7200	7000	6200	6600
69	9200	7500	7700	8000	8100	8000	8300	6500	6200	6100	7700
68	8300	7400	7600	8000	7800	7700	7900	6200	5900	6800	8600
67	9100	9200	8700	8400	7900	8800	6000	6600	7100	7400	8700
66	18000	8600	8000	8100	8000	8600	6000	6200	6900	7800	8200
65	15000	8800	8000	7900	8000	6400	6200	6800	7000	7400	8200
64	10400	8400	8600	7700	8200	6200	6100	6100	6800	7100	8200
63	9200	8600	8800	9000	9100	6200	5600	5700	7600	7400	7200
62	9000	8700	8600	8100	8100	6100	5700	5600	6600	7700	8300
61	9000	8900	9400	8200	7400	7400	6900	6400	5500	6800	9300
60	8400	8600	8500	8500	7900	7500	6300	5600	6400	6200	9600
59	8700	8700	8900	7800	8500	7700	7000	6100	6400	8500	10100
58	8300	8200	8600	8400	8800	8300	8400	7000	6500	8300	9800
57	7800	7900	8300	8100	9500	9300	8800	7800	8400	7700	8300
56	9200	9000	8900	9100	8800	8800	9200	8300	8600	7900	9200
55	8900	8600	9100	8600	8400	8300	7300	8100	6800	7400	9400
54	9200	9100	8400	8400	6800	7400	7600	9300	6200	6900	8400
53	9200	9000	9200	9500	9400	7400	5800	6600	7800	7600	9400
52	8400	9600	9800	9100	8000	6500	5800	6300	6900	10000	10200
51	9400	10500	9800	9200	6500	6100	5100	5400	6300	8900	9600
50	9600	10300	9700	9400	7000	5700	6100	6100	7100	8400	9100
49	9600	9300	9100	8300	6600	5900	5300	6100	6800	8300	8100
48	9900	8700	7800	8100	6800	5300	5800	5700	6500	6200	6700
47	9100	8800	8700	7900	6100	6000	5100	5200	6100	6000	6100
46	7900	8300	8100	7200	6900	6300	6200	5600	6400	7000	7400
45	8600	9000	8400	8300	6600	7200	6400	6500	7100	7900	7200
44	8400	8600	8700	8400	7700	7500	7000	5600	7700	7800	7300
43	8600	8200	8100	7700	8100	8000	8100	8300	7200	8000	7700
42	8400	8300	7900	7800	7900	8000	8000	7400	7200	7400	7200
41	8200	7900	7400	8100	7800	7500	7200	7200	7100	6900	7000
40	7800	8100	8000	7700	7600	7700	8200	8000	6800	7300	7400
39	7800	7700	7800	7600	6200	8600	8000	8700	7200	7400	7700
38	7700	7800	7600	7400	7800	8000	8000	8600	7100	7400	8100
37	7700	8100	7600	7100	7200	7500	7600	8600	7000	7700	8000
36	6100	6000	6400	7100	8500	7700	8200	9300	8400	9600	13500
35	6300	6200	6600	7000	8400	8600	9100	9000	9800	9600	9700
34	7300	6400	6500	7100	8600	8700	8800	8600	10000	9700	9500
33	6600	6500	6400	7100	7900	8200	8600	10000	9800	9900	10000

Gamma Survey Spreadsheet

32	7200	6200	6300	6400	7400	8200	7800	9300	9900	10000	9800
31	6600	6800	6600	7100	7500	8300	8400	9100	10100	10300	9800
30	5700	6800	6700	6900	6900	7700	8000	8600	9900	11200	10100
29		7800	6000	6500	7300	8500	7400	8200	9800	9400	10100
28		7800	6500	6500	7500	8300	7900	7900	7800	8000	10100
27		8900	6300	6200	8200	8500	8300	8700	9600	10000	11100
26			8400	6400	8500	8600	6900	8700	9400	9400	10500
25			6800	6800	8400	9000	8300	9100	9700	9800	10300
24			6700	6900	8700	8000	8200	9400	9700	10800	11500
23			6400	6500	8700	7900	8300	9800	9600	9700	10600
22		6300	6700	6600	8200	8400	8800	8500	8800	9900	8700
21		6900	6800	6700	8700	8000	8700	8700	8700	8400	8800
20		7300	7100	6800	8500	6800	8600	9000	8900	8700	10300
19		7400	7200	7200	8800	8800	9000	9900	9800	10100	10600
18		7400	7000	8600	9200	10000	9100	9400	9700	10000	10600
17	6400	6600	7100	8600	8400	9000	8700	8800	9400	9700	10100
16	7600	8100	8400	8800	8900	8600	9700	9600	9500	9700	10300
15	*9900*	*9600*	*8300*	*8200*	*8600*	*9400*	*10800*	*10200*	*8600*	*9100*	*8900*
14	8700	9100	8100	7900	9500	7700	8900	9100	9400	9700	10200
13	7400	8600	8100	8100	7200	6800	7500	8900	9400	9300	9100
12	9100	10000	10100	7700	6600	6500	6700	6500	8600	8300	8200
11	9200	9800	7900	7200	6600	6500	6800	6600	6600	6800	6900
10	8700	6300	6500	6400					6700	6800	6900
9	8200	7300	6900	7200					6800	6600	6700
8	8100	7100	7000	6400					7000	6900	7000
7	8200	8100	7100						7000	7100	7000
6	8100	8200	8300	7200					7600	7100	7000
5											
4											
3											
2											
1											
WW	KK	JJ	II	HH	GG	FF	EE	DD	CC	BB	AA

Gamma Survey Spreadsheet

WW	Z	Y	X	W	V	U	T	S	R	Q	P
93											
92	7100	6600	7200	7200	7100	7400	8300	8600	8000	7800	7300
91	6600	6300	7200	7100	6900	7500	8500	9100	9100	7700	5700
90	5900	5700	6800	6600	6800	7400	8500	8000	8100	6700	5600
89	8000	6300	5800	5700	6100	7400	8400	8100	8500	6000	5600
88	6900	6200	5900	6300	6200	7400	7300	9000	8200	6800	5500
87	8300	7100	6300	6800	6900	7600	7500	8300	6200	7100	6700
86	9200	8900	7700	7600	7700	7800	8100	8200	6900	6800	6600
85	7600	8300	8600	8400	7900	8300	8300	8400	6700	7300	7800
84	9000	8200	7400	7300	7800	7100	8000	7500	7200	7700	7800
83	7600	8000	7300	7600	7100	7200	6100	6200	7700	8150	7100
82	7800	7200	7400	7100	7500	7600	5300	5800	6300	7300	8100
81	5300	6200	7100	7400	7500	7300	5800	5400	6100	7800	8100
80	5300	5400	6700	7800	7300	7400	6200	5400	5800	7600	8400
79	5100	5700	6100	6300	7200	7400	7800	5500	6100	7900	8000
78	5800	5300	6400	6900	7600	8100	7700	7700	7300	7000	7600
77	6600	6500	7100	7200	8400	8600	7800	8000	7700	8000	13000
76	6700	7800	8500	8800	7700	7600	8500	8100	8300	7700	8000
75	7000	7200	8100	7700	8600	8100	8100	8000	9300	9700	8200
74	7000	7200	7600	7800	7700	7600	6600	8100	7500	7200	7500
73	7100	6800	7500	9000	9300	8200	7200	7100	8800	8800	6700
72	6900	6700	7500	7400	9000	8600	8200	8100	6600	6000	5700
71	7100	6800	7200	7100	8300	8400	8400	5600	5800	5700	5700
70	6700	6300	7050	7200	8100	8200	7200	5700	5800	5400	5800
69	7800	6100	17100	7000	7700	8300	8500	5600	6000	5800	6300
68	7100	6600	6700	6500	7300	7600	8100	7700	7500	6800	7800
67	8200	7200	6600	6400	7200	8500	9000	8000	8100	7800	8100
66	8200	8000	7000	7200	7300	8200	8600	7900	7900	8500	8600
65	8100	8500	7600	7300	7200	8100	8500	8400	7300	7600	7500
64	8900	8200	7800	8300	8100	7900	8000	7600	7900	7400	7500
63	8100	9000	7900	8100	7700	8000	7400	8100	8500	7500	6300
62	8200	7800	7300	7700	7800	7900	5800	6100	5800	5400	6700
61	8400	9000	8900	9600	6700	5900	6400	6600	6300	7000	7100
60	7800	9300	8700	9400	6600	6400	6400	6500	6800	6700	6800
59	9600	9400	10200	9400	6500	6300	6200	6600	6700	6700	6600
58	9500	9600	9100	9200	6600	6500	6600	7000	6800	6400	6800
57	8900	9600	9900	9800	7000	6600	6700	6500	6400	6800	7100
56	9200	9500	9600	9800	6800	6800	6700	7000	6900	6600	6800
55	9300	9300	9800	9200	6900	8000	8100	8800	7900	8800	10100
54	9300	9600	10400	9600	9400	8200	8400	8100	8100	9600	9800
53	8900	9500	9200	9900	9400	9200	9800	9400	8900	9500	9600
52	9300	9100	9000	9600	9500	9300	9700	9800	9400	10000	9800
51	9800	8800	8700	8900	9100	9400	9700	9800	10200	9200	10200
50	9400	9300	9200	8600	8800	9800	9100	9000	9200	9100	8200
49	8800	9700	8600	8800	8400	9100	9200	8400	8700	7400	7100
48	8100	8200	8000	8400	8300	9100	9200	8100	7600	6400	9800
47	7800	8600	8500	8400	8700	9200	8400	8100	7500	7900	8400
46	9400	9100	9200	8700	8400	8300	8100	8400	7800	8300	8600
45	8400	8900	9900	8700	8600	8700	8100	7400	7700	7200	8400
44	7300	8000	8100	8000	8300	7600	7500	7800	7400	7400	7400
43	7700	7400	7700	8100	8100	7600	7600	7400	7300	7600	8100
42	7200	7800	7600	8400	7800	8100	7800	7700	7600	7000	6900
41	7100	7100	7200	7500	8000	8100	7700	7600	7800	7700	7500
40	7500	8000	7300	8000	7800	7600	7600	8000	8100	7300	7600
39	7800	7000	6900	7800	8200	8000	7500	7300	7800	7700	7900
38	8900	8300	8100	8000	8000	7900	7800	7700	7900	7300	8400
37	8200	8500	8900	8000	9000	7900	8100	8300	8200	7800	8100
36	9700	9000	7000	9400	9300	9100	8900	7800	7500	8200	7900
35	9700	9700	9200	11000	8000	10200	9900	8700	7100	8200	8100
34	9600	9200	9600	9400	9400	9600	8900	7600	7400	8500	9000
33	9900	10500	10600	10600	10100	9400	8700	8100	7700	9200	9500

Gamma Survey Spreadsheet

32	9800	10900	9000	8400	9600	10100	9100	9100	9000	9800	8900
31	9900	10600	9800	8300	10000	10000	9000	8900	9000	9000	9400
30	10000	10350	10200	10300	8300	9400	9000	8600	8400	10100	9000
29	10200	10000	9100	9000	7800	9000	8700	8400	8600	8800	8600
28	10100	11000	10300	9000			9400	9600	10000	9800	9300
27	8700	10600					9800	10100	10200	10000	10300
26	10300	9600				9400	9800	10100	10900	11800	10200
25	11100	11300	11100	11100	11900	9700	9800	10100	10300	10600	10200
24	10200	10700	10600	10600	10700	10100	10200	9900	9800	10900	11800
23	10100	10000	9000	9900	9300	9900	10800	10100	9700	10100	8900
22	8500	8700	8800	9300	9600	10300	9400	9600	9600	10100	8300
21	8600	8700	8600	9200	9000	8700	9100	8900	11100	9200	8900
20	9000	10400	10300	9800	9900	9200	9200	9400	9000	9100	9300
19	9900	11300	11000	10000	11000	9700	9400	9400	9300	9800	9500
18	11400	10600	11100	10300	11800	11500	10100	9700	9700	9600	10100
17	10400	10200	11000	10800	10700	10500	9600	9100	8700	9500	10000
16	10100	10100	10600	11700	10800	11200	9700	8600	9100	9600	9800
15	10200	10200	11400	11200	12900	9200	9100	9000	8900	9400	9600
14	12800	12000	10800	11200	11000	9800	9400	8900	9200	9800	10100
13	9200	9700	10000	10500	10700	9900	8700	8800	8400	9500	9800
12	8000	9700	9500	9500	10300	10100	8900	9400	8400	9200	9600
11	7800	8800	9200	9300	9500	8700	9100	8800	8500	8700	9400
10	6500	6700	6700	7300	8300	7900	7600	7800	7800	7900	8300
9	6800	6700	7200	7000	6900	8000	7800	7700	8100	6500	6600
8	6800	6900	7200	7100	7100	7700	7600	7100	7100	6500	6500
7	6900	6700	7100	6900	7200	6700	7000	6900	6900	6700	6500
6	7200	7200	6800	6700	7000	6400	6500	6400	6300	6500	6500
5	6600	7200	6200	7400	6800	6300	6200	6400	6300	6400	6400
4		7600	8100	7200	8000	8100	7900	8300	7900	6500	6300
3		10500	9500	9600	8600	8200	8500	7700	7800	8700	8800
2					9300	8900	7900	8500	7700	8900	9400
1					10200	8700	9100	8900	8600	9200	8700
WW	Z	Y	X	W	V	U	T	S	R	Q	P

Gamma Survey Spreadsheet

WW	O	N	M	L	K	J	I	H	G	F	E
93											
92	6900										
91	7500	7000									
90	5900	6900	7200								
89	6100	6000	8400								
88	6300	5700	7800								
87	5600	6400	8100								
86	6300	6400	7800								
85	6400	6300	8000								
84	5800	6800	8500								
83	6200	6400	8200								
82	7200	6400	8700								
81	7100	6300	8400								
80	7700	7300	8400	8500							
79	7500	7400	8400	9300							
78	7500	7300	8500	8000							
77	7700	6000	8400	7000							
76	6700	6200	9100	7900							
75	6500	7500	8600	8000							
74	6700	6900	8300	8800							
73	7000	7000	10000	7300							
72	6000	6000	9000	8600							
71	5800	7800	9100	8000							
70	6500	8200	8900								
69	7800	8700	8900								
68	6900	9000	8700								
67	7300	8400	8300								
66	8300	8500	8600	8000							
65	8800	8300	7600	8100	8700						
64	6700	7100	8100	8600	8800	8900	9200	9400	9000	8900	8800
63	6700	6200	7600	7900	8800	8700	8700	9500	8800	8800	9500
62	6800	6800	6600	7400	7300	7200	7400	7700	7400	7800	9000
61	6500	6400	7500	7900	7600	7900	6500	6800	6300	7300	6560
60	6700	6500	7000	7200	8100	7250	7500	7900	7500	7700	7600
59	6800	6800	7200	8200	7600	7100	7300	7400	7200	7700	7500
58	6300	6900	7300	7400	7900	7100	7100	7800	7400	6900	8100
57	6600	6700	7400	7500	7500	7700	7400	7200	7300	7900	8000
56	7000	6800	7200	7600	7550	8000	6000	7000	7340	7300	6800
55	8500	8800	9700	10000	9700	8200	6300	6150	6800	6700	7120
54	10300	10200	10000	10300	10400	9800	9500	9185	9600	9300	10114
53	9200	9400	9500	9700	10000	11000	11799	10151	10418	12300	10245
52	7400	8200	9900	10100	10100	11300	10900	12400	20000	25000	15900
51	8200	7400	8600	9800	9800	11100	11600	40900	278000	626000	16200
50	6800	8400	9600	10100	10500	10600	12500	15400	50000	30000	16000
49	9600	9200	9400	9800	10000	10400	10800	12000	12400	31000	14000
48	9300	9600	9800	10400	10500	11000	15549	13413	11305	12800	12605
47	8600	8100	10500	10300	10400	10600	9998	10157	19500	10520	10095
46	8900	8400	8900	10900	9900	10800	9037	9305	28840	11809	11610
45	8700	8100	8400	9400	8300	9200	8831	12498	13605	10377	11711
44	7500	8100	8400	8500	8800	8900	10400	20000	16000	10400	10500
43	8300	7800	8300	8300	8500	9300	9400	14700	10400	10000	10000
42	7300	7400	7400	8500	8700	9000	10000	14000	9100	10600	11300
41	6800	7000	8300	8300	8200	8700	9100	8500	8300	10400	8700
40	7200	6800	8300	8000	8500	9000	7310	9469	7800	8980	8640
39	7600	7200	6800	7600	9000	8400	8260	9010	9091	8511	8683
38	8300	7600	7700	7800	7900	8500	8610	8415	8710	8090	7900
37	7900	7300	8600	8100	8000	8500	8406	10050	8260	8027	8037
36	8300	8900	8800	9400	9100	8800	9500	10500	9100	9600	9700
35	8600	9200	9200	9300	8700	8700	9500	9500	11500	11300	11000
34	9200	9800	8200	9200	9200	8500	8500	8300	7400	9800	11200
33	9100	9000	9000	8400	9800	9200	8400	8600	8500	8700	10500

Gamma Survey Spreadsheet

32	8800	8600	8800	9000	8300	8400	8300	7200	7800	8400	8800
31	9200	8600	8300	8100	9600	8700	8700	8200	8000	7800	8500
30	8600	8200	9000	8000	9000	10600	8500	7900	7700	7600	7400
29	9000	8600	10200	8900	9800	9400	8300	7200	7700	7300	7000
28	9900	10700	7800	9900	9600	9700	8615	7180	7402	7694	7214
27	10200	10100	10200	10500	11100	9700	8460	7420	8014	8205	7209
26	9900	9800	9200	10700	10400	10000	8000	7800	7500	8463	7390
25	10700	9600	9800	9800	11400	10400	9150	8100	8200	8200	9100
24	7400	7600	9100	9700	11300	10300	8900	9400	9200	9600	9400
23	7700	9700	10100	9600	8800	9500	9400	8700	8600	9300	11300
22	7600	8900	9000	9200	9600	9800	10000	9300	10100	9600	8800
21	7800	8700	9600	9200	9000	10700	10500	8700	8900	9600	9200
20	9400	9500	10300	10000	9800	10600	9600	8800	8600	9500	9000
19	10300	10100	10200	10800	9200	9400	8500	9300	9200	9070	7900
18	9800	10300	10500	10300	9500	10000	9500	9000	9600	8500	8000
17	10200	9900	11000	10300	10500	11100	8600	9300	9400	9800	9200
16	10100	9800	11200	11200	11000	10600	9500	9100	9600	10000	9000
15	10500	10100	12200	10600	11000	11100	10400	10300	10200	10000	10250
14	10400	10200	11100	11800	10900	10700	9300	9700	9800	10000	10000
13	9400	10200	11120	10700	10300	10300	8800	9500	9200	10100	10500
12	9700	9700	10100	10200	9700	10100	9300	9100	9600	10500	11000
11	9300	9700	10350	10300	10100	9200	8700	8750	8700	9400	9600
10	8600	8700	9100	10500	9200	9100	8500	8400	8600	8100	8100
9	6400	6600	6800	7400	6900	7200	5600	5900	6300	6300	6100
8	6800	6700	7000	7300	7500	7300	5600	5800	5800	5800	5600
7	6300	6400	6700	6300	6700	7100	6500	6700	6700	6600	6900
6	6200	6300	6400	6300	7000	7100	6700	6600	7200	6300	7100
5	6400	6500	6500	6600	7000	6900	6400	6200	6600	8300	8100
4	6700	6600	7100	7200	7300	7200	5600	5700	6600	6590	6300
3	9300	9400	8800	8300	8900	9000	6900	7200	7290	7300	7750
2	9200	8800	8800	9700	9600	9800	8750	8834	8560	8000	7300
1	7900	3000	8300	9900	10300	10100	8100	9200	8600	7400	7900
WW	O	N	M	L	K	J	I	H	G	F	E

Gamma Survey Spreadsheet

WW	D	C	B	A	A-	B-	C-	D-	E-	F-	G-
93											
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64	9000	9600									
63	9100	9500	9800	10100	8700	10000	9300				
62	9000	9000	10200	10300	8900	8900	8500				
61	6898	7900	7800	8000	9200	8700	8700				
60	7600	7900	8500	9300	10100	9300	8500				
59	7600	8200	8900	8400	9500	8700	8600				
58	7500	8000	8300	8500	9500	9700	9600				
57	8000	8400	8700	8400	9400	9900	9900				
56	7470	7278	7410	8200	9400	9900	9300				
55	7525	7111	7580	8900	10500	9000	9000				
54	9105	7415	7400	8800	9800	9400	9300				
53	11144	13445	9066	9900	9600	9600	9300				
52	43000	30000	10700	10600	9400	9200	8900				
51	17000	12200	10700	10700	9600	9800	8200				
50	13500	10500	10300	9300	9800	10200	9600				
49	13000	11100	10900	10200	9800	10000	9500				
48	11384	10000	11300	10300	9900	9800	7800				
47	11497	9800	11500	10500	9500	9500	9400				
46	9605	9200	9200	10000	9500	9400	9300				
45	9083	8410	9400	8800	10000	9000					
44	10000	9200	8400	8500	9400	8500					
43	8800	8900	8500	8500							
42	8900	7200	7300	7900							
41	7700	7600	7500	7400							
40	8410	7100	7100	7200							
39	9760	7700	7200	6900							
38	6900	7400	6500	6900	8500	8400	8300	7400	9600	9100	
37	6600	7400	7700	7200	8800	9800	9000	9000	9400	8900	
36	10200	7100	7300	7800	8900	8900	9400	9400	9200	9000	
35	7800	7100	7500	7200	8700	9400	8600	9400	9400	8700	
34	8200	6900	6900	8100	8800	8600	8600	8900	9000	8800	
33	8900	7400	7500	7800	8900	8300	9200	9200	9100	8800	

Gamma Survey Spreadsheet

32	8300	7100	7800	7900	8700	9100	10000	9300	9200	8700	
31	7900	7900	7800	7500	8400	9700	9100	9000	8900	8600	
30	6900	7400	7100	7300	8600	8700	8500	8900	8900	8800	
29	7000	8100	7300	7500	8100	8700	9100	9500	9200	8900	
28	7800	8400	9200	8700	9000	9100	9000	10800	9100	8800	
27	7900	8100	8000	8300	9700	9700	9800	10500	10000	8900	9000
26	8300	8100	7900	7800	9700	9700	9900	11800	10600	9600	9000
25	7700	7680	8600	8500	9100	9600	10400	10700	11600	12100	9400
24	8000	8700	8500	8500	9500	9800	10600	9500	9400	10200	9200
23	8000	8500	8600	8500	9700	10200	9500	9100	9300	9200	9300
22	8500	8500	8500	9100	9200	9100	8800	8500	9400	9000	8700
21	8400	8500	7800	8500	9800	10200	8400	8800	9600	9100	8600
20	8300	9000	8700	8700	9800	9700	9700	8400	10100	9200	8400
19	8600	8600	8700	8700	9400	9400	10200	8900	9800	9100	8600
18	8500	8700	8500	9400	9700	9400	10400	9800	8900	9100	9000
17	8100	8500	8900	8200	9000	9700	10700	9600	8800	9100	8700
16	8900	8900	8900	8700	9600	9600	11000	10100	8900	9200	8800
15	9000	8300	7900	8700	9800	9200	9500	8900	8600	9100	8700
14	9000	9000	9000	7300	9100	9400	9800	9100	8700	8000	8100
13	9000	8200	8000	7300	9100	9000	9000	8900	9200	7900	7900
12	9200	7700	7200	8300	8900	9000	8400	8600	8600	8200	9400
11	9200	7900	8000	8400	8800	8300	9100	8700	8700	8800	8700
10	8100										
9	8000										
8	7800										
7	9700										
6	9600										
5	9500										
4	8900										
3	8350										
2	8600										
1	8700										
WW	D	C	B	A	A-	B-	C-	D-	E-	F-	G-

Gamma Survey Spreadsheet

WW	H-	I-	J-	K-	L-	M-	N-	O-	P-	Q-	R-
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Gamma Survey Spreadsheet

32											
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29											
28											
27	8800	9500	9800	9400	9800						
26	9700	9600	9700	9600	9800						
25	9100	9200	8500	8400	8700						
24	9200	9100	8900	8500	9200	9000	9100	8900	9000	7400	
23	8900	8500	9200	8400	8900	8900	10000	9300	8000	7600	
22	8600	9000	8600	8700	8400	8500	8800	8400	8600	7400	
21	8900	9200	8700	8300	8700	9400	9100	9400	8100	7800	
20	8800	8800	8700	9600	9700	8300	9100	8100	7900	7700	
19	8700	8700	7800	8800	8400	8700	8300	7900	8300	7800	
18	9000	8500	7900	8700	9800	9300	9300	8800	8900	8000	
17	9200	8800	8200	10000	9300	9500	8900	8700	9700	7800	
16	8900	8500	8300	8800	8600	9400	9100	9000	9000	7800	
15	9000	8600	8900	7800	8600	9400	9300	11600	8800	7700	
14	9700	11800	9200	8900	9200	8400	9400	13900	8600	8300	
13	9400	9100	9300	8800	9000	8800	8200	7800	6900	8300	
12	9200	9000	8900	8800	9000	8700	8000	8000	7600	8200	
11	8900	9600	9000	8800	8100	8400	8300	8100	7800	8800	
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WW	H-	I-	J-	K-	L-	M-	N-	O-	P-	Q-	R-

APPENDIX A

SURFACE GAMMA SPREADSHEET

APPENDIX B

DOWNHOLE GAMMA READINGS

NORTHERN AREA DOWNHOLE GAMMA DATA

Boring Number	Location (site 5 meter grid)	Depth (feet)	Gamma Exceedance Intervals (feet below ground surface)
12	MM-66	9' 3"	0 - 1.5'
12A	MM-66.5	9' 4"	0 - 1'
13	PP.5-66.5	9' 1"	--
13A	PP-67	9' 5"	0 - 2'
13B	OO.5-67	9' 4"	--
14	PP-62.5	9' 3"	--
15	SS.5-58.25	8' 8"	--
16	LL-59	9' 6"	--
17	MM-61	9' 3"	--
18	SS-50.5	9'	0 - 2'
18A	TT.5-51.5	9' 4"	--
18B	TT.5-5.0	9' 7"	--
19	OO.5-51	9" 4"	0 - 5'
19A	00.5-51.5	9'	2 - 6'
19B	PP-51	9' 7"	--
19C	OO.5-50.5	9' 5"	--
19D	OO.5-52.5	9' 7"	--
19E	OO-51	9' 5"	1.5 - 4'
19F	NN.5-51	9' 5"	--

Highlighted borings/depths exceed USEPA cleanup level.

Date: 08/17/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Stewart
Operational Check 12770 cpm

Cutoff Value = 7.1pCi/gm = ~~x~~ calibrated for
5,574 counts per 30 Sec. steel, PVC used

10'

Boring # MM-66 (Max Depth 9' 3" ft) 9" ext

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	31251	15.5	
1	10622	16	
1.5	6172	16.5	
2	4669	17	
2.5	4317	17.5	
3	4364	18	
3.5	4308	18.5	
4	4380	19	
4.5	5238	19.5	
5	4803	20	
5.5	4666	20.5	
6	4442	21	
6.5	3890	21.5	
7	4187	22	
7.5	4141	22.5	
8	4108	23	
8.5	4342	23.5	
9	4803	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lake Shore
East

Date: 08/13/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12770 cpm

Cutoff Value = 7.1pCi/gm = calibrated for
5,574 counts per 30 Sec. Steel, PVC used

Boring #MM-66.25 12A (Max Depth 9' 4" ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	9178	15.5	
1	5801	16	
1.5	5086	16.5	
2	4720	17	
2.5	3941	17.5	
3	4784	18	
3.5	4480	18.5	
4	3864	19	
4.5	3571	19.5	
5	4175	20	
5.5	4491	20.5	
6	4664	21	
6.5	4552	21.5	
7	4413	22	
7.5	4615	22.5	
8	4914	23	
8.5	5102	23.5	
9	5166	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/14/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Stewart
Operational Check 12140 cpm

13

Cutoff Value = 7.1pCi/gm = *calibrated for*
5,574 counts per 30 Sec. *Steel, PVC used*

PP.5-66.5

Boring # - (Max Depth 9 ft)

1"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	1980	15.5	
1	2115	16	
1.5	1733	16.5	
2	2101	17	
2.5	2755	17.5	
3	2715	18	
3.5	2566	18.5	
4	2400	19	
4.5	2517	19.5	
5	2925	20	
5.5	2873	20.5	
6	2479	21	
6.5	2179	21.5	
7	2275	22	
7.5	2139	22.5	
8	2122	23	
8.5	2133	23.5	
9	1955	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/14/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12140 cpm

Cutoff Value = 7.1pCi/gm =
5,574 counts per 30 Sec.

Boring #PP-67 (Max Depth 9 ft) 5"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	245,917	15.5	
1	269,930	16	
1.5	47,196	16.5	
2	10,348	17	
2.5	4,302	17.5	
3	2708	18	
3.5	2415	18.5	
4	2615	19	
4.5	2629	19.5	
5	2512	20	
5.5	2369	20.5	
6	2020	21	
6.5	2257	21.5	
7	2275	22	
7.5	2322	22.5	
8	2858	23	
8.5	3294	23.5	
9	3770	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/14/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

13.8

Technician Toby Sham
Operational Check 1240 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. steel, PVC used

00.5-67

Boring #~~10~~- (Max Depth 9' 4" ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2379	15.5	
1	2265	16	
1.5	2061	16.5	
2	2940	17	
2.5	2959	17.5	
3	2491	18	
3.5	2419	18.5	
4	2587	19	
4.5	2466	19.5	
5	2306	20	
5.5	2365	20.5	
6	2431	21	
6.5	2777	21.5	
7	3315	22	
7.5	2977	22.5	
8	3645	23	
8.5	3397	23.5	
9	3219	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 8/14/01

Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Stewan
Operational Check 12140 cpm

Cutoff Value = 7.1pCi/gm = calibrated for
5,574 counts per 30 Sec. steel, PVC used

Boring #PP-62.5 (Max Depth 9 ft 3")

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2225	15.5	
1	1906	16	
1.5	2134	16.5	
2	1979	17	
2.5	2616	17.5	
3	2972	18	
3.5	2816	18.5	
4	2846	19	
4.5	2821	19.5	
5	3038	20	
5.5	3433	20.5	
6	3238	21	
6.5	3052	21.5	
7	3407	22	
7.5	3476	22.5	
8	2853	23	
8.5	2396	23.5	
9	2632	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/14/01 Technician Toby Shewan
Instrument Model # Ludlum 2221 Operational Check 12140 cpm
Serial # 126497
Probe Model # PR 44-10
Serial # 171991 Cutoff Value = 7.1pCi/gm ⇒ calibrated for
• Shielded (2") **5,574 counts per 30 Sec.** steel, PVC used

Boring # 55.5 - 58.25 **-** (Max Depth 8 ft) 8"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2876	15.5	
1	2999	16	
1.5	2568	16.5	
2	2165	17	
2.5	2874	17.5	
3	3262	18	
3.5	2907	18.5	
4	2321	19	
4.5	1989	19.5	
5	1783	20	
5.5	1736	20.5	
6	1888	21	
6.5	2197	21.5	
7	2582	22	
7.5	2391	22.5	
8	2077	23	
8.5	2181	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/14/01

Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

1.6

Technician Toby Shewan
Operational Check 12140 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. steel, PVC was used

Boring #LL-59 (Max Depth 9' 6" ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2673	15.5	
1	3652	16	
1.5	4688	16.5	
2	4208	17	
2.5	3376	17.5	
3	2386	18	
3.5	2975	18.5	
4	3348	19	
4.5	3525	19.5	
5	3562	20	
5.5	3618	20.5	
6	3574	21	
6.5	4222	21.5	
7	4786	22	
7.5	5377	22.5	
8	5487	23	
8.5	5272	23.5	
9	5231	24	
9.5	5383	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01

Technician Toby Stewan

Instrument Model # Ludlum 2221

Operational Check 12452

Serial # 126497

Probe Model # PR 44-10

Serial # 171991

Cutoff Value = 7.1pCi/gm = Calibrated for

• Shielded (2") 18

5,574 counts per 30 Sec. Steel PVC was used

Boring # 55 50.5 - (Max Depth 9 ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	44,607	15.5	
1	341,398	16	
1.5	82,508	16.5	
2	12,665	17	
2.5	5,490	17.5	
3	3,497	18	
3.5	2637	18.5	
4	2168	19	
4.5	1984	19.5	
5	1934	20	
5.5	2380	20.5	
6	2141	21	
6.5	1842	21.5	
7	1780	22	
7.5	2231	22.5	
8	1820	23	
8.5	1663	23.5	
9	1558	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

1'

Date: 08/14/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12140 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for steel, PVC was used
5,574 counts per 30 Sec.

Boring #MW-61 (Max Depth 9 ft) 3"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2689	15.5	
1	2999	16	
1.5	3161	16.5	
2	3360	17	
2.5	3421	17.5	
3	3408	18	
3.5	3127	18.5	
4	2783	19	
4.5	3110	19.5	
5	3149	20	
5.5	3005	20.5	
6	2928	21	
6.5	2882	21.5	
7	2808	22	
7.5	2728	22.5	
8	2795	23	
8.5	2777	23.5	
9	2643	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

13A

Technician Toby Shewan
Operational Check 12452 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. Steel, PVC was used

TT:5-51.5

Boring # (Max Depth 9 ft 4")

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2211	15.5	
1	2868	16	
1.5	2445	16.5	
2	1838	17	
2.5	2431	17.5	
3	2556	18	
3.5	2546	18.5	
4	1998	19	
4.5	2213	19.5	
5	2523	20	
5.5	2058	20.5	
6	1800	21	
6.5	1654	21.5	
7	1624	22	
7.5	1811	22.5	
8	1646	23	
8.5	1658	23.5	
9	1669	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 8/15/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

19-B

Technician Toby Shewan
Operational Check 12452 cpm

Cutoff Value = 7.1pCi/gm = 5,574 counts per 30 Sec. calibrated for Steel, PVC was used

Boring # TT-5-50 (Max Depth 9 ft) 7"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2413	15.5	
1	2549	16	
1.5	2165	16.5	
2	2402	17	
2.5	3542	17.5	
3	2827	18	
3.5	2143	18.5	
4	1980	19	
4.5	1968	19.5	
5	1738	20	
5.5	1605	20.5	
6	1585	21	
6.5	1589	21.5	
7	1666	22	
7.5	1583	22.5	
8	1589	23	
8.5	1567	23.5	
9	1579	24	
9.5	1757	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12452 cpm

Cutoff Value = 7.1pCi/gm = calibrated for
5,574 counts per 30 Sec. steel, PVC was used

Boring # 00.5-51 - (Max Depth 9 ft) 4"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	7569	15.5	
1	4819	16	
1.5	4915	16.5	
2	5980	17	
2.5	7338	17.5	
3	9047	18	
3.5	9108	18.5	
4	7721	19	
4.5	6732	19.5	
5	5947	20	
5.5	5352	20.5	
6	5100	21	
6.5	4872	21.5	
7	4235	22	
7.5	4832	22.5	
8	3626	23	
8.5	3377	23.5	
9	3029	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12452 cpm

Cutoff Value = 7.1pCi/gm = 5,574 counts per 30 Sec.

Cal.brated for Steel pipe, PVC was used

101A

Boring # 00.5 - 51.5 (Max Depth 9 ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2390	15.5	
1	2237	16	
1.5	3148	16.5	
2	5289	17	
2.5	6299	17.5	
3	6827	18	
3.5	7803	18.5	
4	9070	19	
4.5	9735	19.5	
5	8748	20	
5.5	7711	20.5	
6	6456	21	
6.5	5281	21.5	
7	4733	22	
7.5	3995	22.5	
8	3012	23	
8.5	2609	23.5	
9	2474	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

19-B

Technician Toby Shewan
Operational Check 12452 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. steel, PVC was used

Boring #PP-51 (Max Depth 9 ft) 7"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2453	15.5	
1	2689	16	
1.5	2222	16.5	
2	2754	17	
2.5	4053	17.5	
3	3729	18	
3.5	2977	18.5	
4	2662	19	
4.5	2530	19.5	
5	2650	20	
5.5	3270	20.5	
6	3909	21	
6.5	3768	21.5	
7	3215	22	
7.5	2407	22.5	
8	2662	23	
8.5	3104	23.5	
9	3888	24	
9.5	4219	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01

Instrument Model # Ludlum 2221

Serial # 126497

Probe Model # PR 44-10

Serial # 171991

• Shielded (2")

Technician Toby Shewan

Operational Check 12452 cpm

19.6

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. Steel, PVC was used

00.5 - 50.5

Boring # - (Max Depth 9 ft)

5"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2205	15.5	
1	2200	16	
1.5	2884	16.5	
2	4166	17	
2.5	5212	17.5	
3	4944	18	
3.5	4743	18.5	
4	4591	19	
4.5	4678	19.5	
5	4678	20	
5.5	4681	20.5	
6	4468	21	
6.5	4331	21.5	
7	4249	22	
7.5	3759	22.5	
8	3471	23	
8.5	3388	23.5	
9	3451	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Stewart
Operational Check 12452 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for steel pipe, PVC used
5,574 counts per 30 Sec.

00.5-52.5
Boring # - (Max Depth 9 ft 7")

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3105	15.5	
1	3358	16	
1.5	2424	16.5	
2	2688	17	
2.5	3579	17.5	
3	4031	18	
3.5	4035	18.5	
4	3581	19	
4.5	3075	19.5	
5	2828	20	
5.5	3647	20.5	
6	4195	21	
6.5	4250	21.5	
7	3764	22	
7.5	3565	22.5	
8	3169	23	
8.5	4222	23.5	
9	4443	24	
9.5	4362	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 4/15/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12452 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. Steel pipe, PVC was used

Boring #00-51 (Max Depth 9' 5" ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3490	15.5	
1	3918	16	
1.5	4903	16.5	
2	6083	17	
2.5	6197	17.5	
3	6814	18	
3.5	6571	18.5	
4	5768	19	
4.5	4879	19.5	
5	4541	20	
5.5	4007	20.5	
6	3159	21	
6.5	2988	21.5	
7	4436	22	
7.5	5188	22.5	
8	4396	23	
8.5	3925	23.5	
9	4043	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/15/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Stewan
Operational Check 12452 cpm

Cutoff Value = 7.1pCi/gm = 5,574 counts per 30 Sec. calibrated for steel pipe, PVC was used

19F

NW.5-51

Boring # - (Max Depth 9 ft) 5"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2609	15.5	
1	3309	16	
1.5	3738	16.5	
2	4118	17	
2.5	3362	17.5	
3	3270	18	
3.5	3611	18.5	
4	3878	19	
4.5	3298	19.5	
5	2469	20	
5.5	2456	20.5	
6	2546	21	
6.5	2708	21.5	
7	2443	22	
7.5	2618	22.5	
8	2745	23	
8.5	2735	23.5	
9	3522	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

* open hole where WAter line broke

Date: 08/14/01 Technician ______
Instrument Model # Ludlum 2221 Operational Check ~~12~~ 140
Serial # ~~126497~~ unshilded 134542
Probe Model # ~~PR 44-10~~
Serial # ~~171991~~ ~~1591~~
• Shielded (2") Cutoff Value = 7.1pCi/gm =
5,574 counts per 30 Sec.

Cut off 20,576

Boring # MA 65.5 (Max Depth ft) MAX Count 79,60. cp at abt 1' dep

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5		15.5	
1		16	
1.5		16.5	
2		17	
2.5		17.5	
3		18	
3.5		18.5	
4		19	
4.5		19.5	
5		20	
5.5		20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

SOUTHERN AREA DOWNHOLE GAMMA DATA

Boring Number	Location (site 5 meter gird)	Depth (feet)	Gamma Exceedance Intervals (feet below ground surface)
B-1	E-51.75	8' 11"	--
B-2	G-49.5	8' 4"	--
B-3	G.5-50.5	10' 8"	0 - 10' 8"
B-4	G.5-51.5	6' 8"	0.5 - 2.0'
B-5	F.5-51.5	9' 4"	4.5 - 6"
B-6	D.75-52.75	9' 8"	--
B-7	C.5-52.5	9' 8"	--
B-8	H.5-51.5	9' 10"	0 - 1'
B-9	F-50.5	10' 1"	--
B-4/8	J-52.5	8' 7"	--
B-5A	F.5-52	9' 5"	--
B-3A	H.5-49.75	8' 5"	--
B-8A	I.25-51.5	9' 10"	1.5 - 4.5'
B-8B	J-51.5	9' 7"	--
B-4A	G.5-52	9' 4"	4.5 - 5'
B-4B	G.5-52.75	8' 10"	--

Highlighted borings/depths exceed USEPA cleanup level.

Date: 08/08/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 11846 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. steel pipe, PVC pipe was use

Boring # B-1 (Max Depth 8 ft 11")

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	4759	15.5	
1	4120	16	
1.5	4086	16.5	
2	4082	17	
2.5	4141	17.5	
3	4736	18	
3.5	4838	18.5	
4	4535	19	
4.5	4627	19.5	
5	4663	20	
5.5	4688	20.5	
6	4847	21	
6.5	4937	21.5	
7	5217	22	
7.5	5074	22.5	
8	4786	23	
8.5	4790	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/08/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Stevan
Operational Check 11 846 cpm

Cutoff Value = 7.1pCi/gm = * calibrated fe
5,574 counts per 30 Sec. steel pipe, pl
pipe was u

Boring # B-2 (Max Depth 8 ft 4")

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3793	15.5	
1	4612	16	
1.5	4839	16.5	
2	4031	17	
2.5	3516	17.5	
3	3555	18	
3.5	3258	18.5	
4	3198	19	
4.5	3012	19.5	
5	3084	20	
5.5	3577	20.5	
6	3421	21	
6.5	3170	21.5	
7	3102	22	
7.5	3138	22.5	
8	3234	23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/08/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 11,946 cpm

Cutoff Value = 7.1pCi/gm = *calibrated for
5,574 counts per 30 Sec. steel pipe, pi
pipe was u

Boring # B-3 (Max Depth 10' 8" ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	155,823	15.5	
1	77,417	16	
1.5	34,319	16.5	
2	14,518	17	
2.5	8,148	17.5	
3	6571	18	
3.5	8755	18.5	
4	16,385	19	
4.5	21335	19.5	
5	19800	20	
5.5	18,290	20.5	
6	13,437	21	
6.5	10,634	21.5	
7	10,581	22	
7.5	13,167	22.5	
8	13,082	23	
8.5	12,342	23.5	
9	11,817	24	
9.5	10,752	24.5	
10	10,202	25	
10.5	9334	25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/08/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 11846 cpm

Cutoff Value = 7.1pCi/gm = * calibrated f
5,574 counts per 30 Sec. steel pipe, p
pipe was i

Boring # B - 4 (Max Depth 6 ft)
8"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	10,972	15.5	
1	22871	16	
1.5	58,479	16.5	
2	15,760	17	
2.5	6343	17.5	
3	3689	18	
3.5	3110	18.5	
4	3086	19	
4.5	3051	19.5	
5	2876	20	
5.5	2688	20.5	
6	2865	21	
6.5	3689	21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/08/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Stewart
Operational Check 11846 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. steel pipe, PVC pipe w used

Boring # B-5 (Max Depth 9 ft)
4"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3006	15.5	
1	3633	16	
1.5	3138	16.5	
2	2122	17	
2.5	1745	17.5	
3	1681	18	
3.5	2416	18.5	
4	3351	19	
4.5	3851	19.5	
5	5638	20	
5.5	16,468	20.5	
6	7818	21	
6.5	4254	21.5	
7	3166	22	
7.5	3308	22.5	
8	3814	23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

* pipe obstructed at 8.5'

Date: 08/08/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 11846 cpm

Cutoff Value = 7.1pCi/gm = 5,574 counts per 30 Sec. calibrated fo Steel pipe, Pl pipe was u

Boring # B-6 (Max Depth 9 ft) 8"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2723	15.5	
1	2922	16	
1.5	3399	16.5	
2	4154	17	
2.5	4179	17.5	
3	4298	18	
3.5	4385	18.5	
4	4721	19	
4.5	4624	19.5	
5	4415	20	
5.5	4237	20.5	
6	4265	21	
6.5	4219	21.5	
7	3903	22	
7.5	2902	22.5	
8	3526	23	
8.5	4010	23.5	
9	3740	24	
9.5	3862	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/08/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Stewan
Operational Check 11846 cpm

Cutoff Value = 7.1pCi/gm =* calibrated for
5,574 counts per 30 Sec. pipe. PVC pipe was used

Boring # B-7 (Max Depth 9 ft 8")

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2672	15.5	
1	2575	16	
1.5	2309	16.5	
2	2930	17	
2.5	3600	17.5	
3	3550	18	
3.5	2652	18.5	
4	2007	19	
4.5	1727	19.5	
5	1675	20	
5.5	1952	20.5	
6	2286	21	
6.5	3432	21.5	
7	3431	22	
7.5	3794	22.5	
8	4314	23	
8.5	4157	23.5	
9	3604	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

* bottom of pipe was obstructed so no reading for 9.5'

Date: 08/09/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12115 cpm

Cutoff Value = 7.1pCi/gm * calibrated for
5,574 counts per 30 Sec. steel pipe, 1
pipe was us

Boring # B-8 (Max Depth 9 ft) 10"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	14220	15.5	
1	6229	16	
1.5	4812	16.5	
2	4125	17	
2.5	3192	17.5	
3	3642	18	
3.5	3414	18.5	
4	2830	19	
4.5	2935	19.5	
5	2712	20	
5.5	2346	20.5	
6	2922	21	
6.5	3084	21.5	
7	3442	22	
7.5	3502	22.5	
8	3562	23	
8.5	3684	23.5	
9	3528	24	
9.5	3496	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12,115 cpm

Cutoff Value = 7.1pCi/gm = calibrated to 5,574 counts per 30 Sec. Steel pipe, PVC used

Boring # B-9 (Max Depth 10 ft)
1"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3763	15.5	
1	4261	16	
1.5	4533	16.5	
2	4557	17	
2.5	4365	17.5	
3	4136	18	
3.5	3436	18.5	
4	2896	19	
4.5	2812	19.5	
5	2641	20	
5.5	2552	20.5	
6	2564	21	
6.5	2744	21.5	
7	3394	22	
7.5	3543	22.5	
8	3552	23	
8.5	3609	23.5	
9	3565	24	
9.5	3584	24.5	
10	3779	25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12115 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. steel pipe, PVC was used

Boring # B -5A (Max Depth 9' 5" ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2721	15.5	
1	3177	16	
1.5	3061	16.5	
2	2950	17	
2.5	2616	17.5	
3	2445	18	
3.5	2407	18.5	
4	2603	19	
4.5	3047	19.5	
5	3267	20	
5.5	3123	20.5	
6	2724	21	
6.5	2855	21.5	
7	2925	22	
7.5	2916	22.5	
8	2909	23	
8.5	3042	23.5	
9	3436	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12,115

Cutoff Value = 7.1pCi/gm ⇒ calibrated for
5,574 counts per 30 Sec. Steel pipe, PV pipe was us

Boring #B -3A (Max Depth 8 ft) 5"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3023	15.5	
1	3380	16	
1.5	3930	16.5	
2	4277	17	
2.5	4651	17.5	
3	3947	18	
3.5	3162	18.5	
4	3198	19	
4.5	3214	19.5	
5	3425	20	
5.5	3708	20.5	
6	3485	21	
6.5	3140	21.5	
7	3355	22	
7.5	3655	22.5	
8	3990	23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12115 cpm

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. steel pipe, PVC pipe was used

Boring # B -8A (Max Depth 9 ft 10")

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	3058	15.5	
1	3649	16	
1.5	4777	16.5	
2	9583	17	
2.5	34,840	17.5	
3	36,855	18	
3.5	17,622	18.5	
4	10,438	19	
4.5	5959	19.5	
5	3400	20	
5.5	2842	20.5	
6	3002	21	
6.5	2945	21.5	
7	2964	22	
7.5	3258	22.5	
8	3395	23	
8.5	3599	23.5	
9	3538	24	
9.5	3384	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12115 cpm

Cutoff Value = 7.1pCi/gm = 5,574 counts per 30 Sec. * calibrated for steel pipe, PVC was used

Boring # B -4A(Max Depth 9 ft 4")

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2715	15.5	
1	2885	16	
1.5	2472	16.5	
2	2616	17	
2.5	2717	17.5	
3	3330	18	
3.5	3945	18.5	
4	4144	19	
4.5	4989	19.5	
5	5874	20	
5.5	5305	20.5	
6	4442	21	
6.5	3458	21.5	
7	3474	22	
7.5	3339	22.5	
8	3298	23	
8.5	3386	23.5	
9	3444	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12115 cpm

Cutoff Value = 7.1pCi/gm ⇒ * Calibrated fo steel pipe, PVC pipe was use
5,574 counts per 30 Sec.

Boring #B -8B(Max Depth 9' 7" ft)

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2264	15.5	
1	2197	16	
1.5	2852	16.5	
2	3366	17	
2.5	4723	17.5	
3	5468	18	
3.5	5165	18.5	
4	4060	19	
4.5	4393	19.5	
5	4376	20	
5.5	4378	20.5	
6	3706	21	
6.5	3751	21.5	
7	4193	22	
7.5	4084	22.5	
8	3597	23	
8.5	3676	23.5	
9	3646	24	
9.5	3378	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12115 cpm

Cutoff Value = 7.1pCi/gm = ~~#~~ calibrated for
5,574 counts per 30 Sec. steel pipe, PV pipe was use

Boring # B -4B (Max Depth 8 ft) 10"

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2791	15.5	
1	3467	16	
1.5	3582	16.5	
2	3383	17	
2.5	3109	17.5	
3	3073	18	
3.5	2734	18.5	
4	2579	19	
4.5	2658	19.5	
5	2454	20	
5.5	2364	20.5	
6	2404	21	
6.5	2654	21.5	
7	2835	22	
7.5	3195	22.5	
8	3417	23	
8.5	3377	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Date: 08/09/01
Instrument Model # Ludlum 2221
Serial # 126497
Probe Model # PR 44-10
Serial # 171991
• Shielded (2")

Technician Toby Shewan
Operational Check 12115 c/m

Cutoff Value = 7.1pCi/gm = * calibrated for
5,574 counts per 30 Sec. Steel pipe, PL pipe was used

Boring # 8 -4/8 (Max Depth 8 ft 7")

Depth - FEET	Counts per 30 Seconds	Depth - FEET	Counts per 30 Seconds
0.5	2554	15.5	
1	2785	16	
1.5	2583	16.5	
2	2868 ~~3608~~	17	
2.5	3635	17.5	
3	3088	18	
3.5	3372	18.5	
4	3605	19	
4.5	3474	19.5	
5	3292	20	
5.5	3580	20.5	
6	3652	21	
6.5	3915	21.5	
7	3869	22	
7.5	3227	22.5	
8	2761	23	
8.5	2750	23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Stan A. Huber Consultants, Inc.
Health Physics and Radiation Safety Services

200 North Cedar Road – New Lenox, Illinois 60451-1751
(800) 383-0468 or (815) 485-6161 FAX (815) 485-4433
Homepage: www.sahci.com; E-mail: sahci@aol.com

Fax Transmission Cover Sheet

Date: 08/10/01

To: Steve Torres

Facility: STS

Fax Number: (847)-279-2510

From: Toby Shewan (Stan A. Huber Constultants Inc.)

Number of Pages (Including Cover Sheet) 17

If all pages are not received, please call (815) 485-6161

Memo: Down hole data From Lake Shore East for 08/08/01 and 08/09/01.

APPENDIX C

GAMMA SPEC LABORATORY ANALYSIS

NORTHERN AREA LABORATORY ANALYSIS

Boring Number	Location	Sample Depth (feet)	PB-214 [1] pCi/g	Ac-228 [2] pCi/g	Total Radium [3] pCi/g
12	MM-66	1	1.42	12.6	14.02
12-A	MM-66.25	1	1.80	6.71	8.51
13	PP.5-66.5	1	0.66	0.46	1.12
13-B	OO.5-67	1	0.42	0.36	0.78
14	PP-62.5	1	0.72	0.38	1.10
15	SS.5-58.25	1	0.43	0.23	0.66
16	LL-59	1	0.76	0.55	1.31
18	SS-50.5	1	0.22	0.19	0.41
18	SS-50.5	7	0.37	0.35	0.72
18-A	SS.5-51.5 *	1	0.36	0.31	0.67
18-B	SS.5-50 *	2-3	0.32	0.34	0.66
19	OO.5-51	1	2.98	1.09	4.07
19-A	OO.5-51.5	1	1.55	0.92	2.47
19-A	OO.5-51.5	7	2.14	0.86	3.00
19-B	PP-51	1	0.65	0.57	1.22
19-C	OO.5-50.5	1.5	0.99	0.68	1.67
19-D	OO.5-52.5	1	0.98	0.71	1.69
19-E	OO-51	2	1.19	1.05	2.24
19-F	NN.5-51	1	0.86	0.50	1.36
Grab	PP-59	1	1.03	0.69	1.72

Borings 13-A and 17 were not sampled.

* Borings 18-A and 18-B were listed at TT-5 on chain of custody.

Highlighted samples exceed USEPA cleanup level.

1 Pb-224 is surrogate for Ra-226
2 Ac-228 is surrogate for Ra-228
3 Total Radium is Rz-226 plus Ra-228

==
RSSI High Resolution Gamma Spectroscopy Analysis
==
Quantum Technology
GDR_C Nuclide Activity Summary
==

Sample ID: 012896 STS LAKE SHORE EAST PP-62.5

```
---------------------------------------------------------------------------
Sample Size . . . . . . . 1.28e+003 g | Spectrum File . . H:\PCASPEC\012896.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-16-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
---------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
---------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]       02-01-01 12:00
---------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
---------------------------------------------------------------------------
---------------------------------------------------------------------------
```

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
Ra-223	94.90	4.90e-007	+-1.29e-007	2.74e+002	1 of 7
U-235	Average:	9.40e-008	+-1.59e-008	6.17e+012	2 of 7
	93.35	1.23e-006	+-3.23e-007		
	185.72	9.12e-008	+-1.59e-008		
Th-234	Average:	2.03e-006	+-3.77e-007	5.78e+002	2 of 3
	92.38	2.01e-006	+-5.29e-007		
	92.80	2.04e-006	+-5.36e-007		
Pb-212	Average:	3.79e-007	+-2.04e-008	1.06e+001	2 of 5
	77.11	3.78e-007	+-1.13e-007		
	238.63	3.79e-007	+-2.08e-008		
Pb-214	Average:	7.19e-007	+-2.38e-008	4.47e-001	3 of 6
	241.98	9.90e-007	+-1.07e-007		
	295.21	7.04e-007	+-4.81e-008		
	351.92	7.05e-007	+-2.83e-008		
Tl-208	Average:	1.30e-007	+-1.12e-008	5.09e-002	2 of 5
	510.84	1.39e-007	+-4.21e-008		
	583.14	1.30e-007	+-1.16e-008		
Pa-234	94.66	3.49e-007	+-9.18e-008	6.70e+000	1 of 14
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	3.85e-007	+-3.37e-008	6.13e+000	3 of 10
	338.32	4.23e-007	+-7.29e-008		
	911.07	4.06e-007	+-4.44e-008		
	969.11	2.90e-007	+-7.32e-008		
Ra-224	240.98	1.88e-006	+-2.02e-007	8.69e+001	1 of 1
Tl-210	298.00	1.71e-007	+-1.17e-008	2.17e-002	1 of 3
Bi-211	351.07	2.03e-006	+-8.14e-008	3.55e-002	1 of 1
Bi-214	Average:	7.06e-007	+-2.63e-008	3.32e-001	3 of 7

	609.31	6.77e-007	+-2.89e-008			
	1120.30	7.27e-007	+-9.79e-008			
	1764.50	9.27e-007	+-8.33e-008			
K-40	1460.80	1.14e-005	+-3.09e-007	1.12e+013	1 of	1

TOTAL: 2.08e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012897 STS LAKE SHORE EAST MM-66.25

Sample Size . . . . 8.86e+002 g	Spectrum File . . H:\PCASPEC\012897.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	Average:	1.05e-006 +-1.16e-007	2.74e+002	2 of 7
	83.78	7.16e-007 +-1.26e-007		
	94.90	2.90e-006 +-2.99e-007		
U-235	Average:	2.91e-007 +-3.70e-008	6.17e+012	3 of 7
	89.95	1.40e-005 +-8.85e-007		
	93.35	7.30e-006 +-7.51e-007		
	185.72	2.50e-007 +-3.71e-008		
Th-234	Average:	1.20e-005 +-8.74e-007	5.78e+002	2 of 3
	92.38	1.19e-005 +-1.23e-006		
	92.80	1.21e-005 +-1.24e-006		
Pb-212	Average:	6.62e-006 +-6.96e-008	1.06e+001	5 of 5
	74.82	6.65e-006 +-3.79e-007		
	77.11	6.65e-006 +-2.57e-007		
	87.30	6.65e-006 +-4.05e-007		
	238.63	6.65e-006 +-7.55e-008		
	300.09	4.46e-006 +-6.00e-007		
Pb-214	Average:	1.80e-006 +-4.84e-008	4.47e-001	4 of 6
	74.82	2.05e-006 +-6.52e-007		
	241.98	5.45e-006 +-1.95e-007		
	295.21	1.51e-006 +-1.08e-007		
	351.92	1.56e-006 +-5.67e-008		
Tl-208	Average:	2.21e-006 +-3.72e-008	5.09e-002	5 of 5
	74.97	2.16e-006 +-1.18e-006		
	277.35	2.08e-006 +-2.78e-007		
	510.84	2.46e-006 +-1.13e-007		
	583.14	2.17e-006 +-4.08e-008		
	860.37	2.63e-006 +-1.93e-007		

Th-231	84.21	2.75e-006 +-4.82e-007	2.55e+001	1 of	1
Th-228	84.37	1.46e-005 +-2.57e-006	1.68e+004	1 of	2
Pa-234	Average:	6.27e-007 +-1.03e-007	6.70e+000	2 of	14
	94.66	6.26e-007 +-2.13e-007			
	131.20	6.27e-007 +-1.18e-007			
Ra-226	186.10	I.D.Only	1.40e+007	1 of	1
Ac-228	Average:	6.71e-006 +-9.40e-008	6.13e+000	10 of	10
	209.28	5.58e-006 +-5.30e-007			
	270.23	6.13e-006 +-5.23e-007			
	327.64	6.28e-006 +-6.13e-007			
	338.32	6.44e-006 +-2.16e-007			
	409.51	6.24e-006 +-8.64e-007			
	463.00	6.45e-006 +-4.92e-007			
	794.70	5.06e-006 +-5.19e-007			
	911.07	7.00e-006 +-1.48e-007			
	964.60	6.45e-006 +-4.73e-007			
	969.11	7.12e-006 +-2.12e-007			
Ra-224	240.98	1.03e-005 +-3.69e-007	8.69e+001	1 of	1
Tl-210	298.00	3.67e-007 +-2.62e-008	2.17e-002	1 of	3
Bi-212	727.17	4.30e-006 +-2.27e-007	1.01e+000	1 of	2
Bi-211	351.07	4.50e-006 +-1.63e-007	3.55e-002	1 of	1
Bi-214	Average:	1.55e-006 +-5.33e-008	3.32e-001	3 of	7
	609.31	1.49e-006 +-5.95e-008			
	1120.30	1.59e-006 +-1.72e-007			
	1764.50	1.98e-006 +-1.68e-007			
K-40	1460.80	1.18e-005 +-4.13e-007	1.12e+013	1 of	1
TOTAL:		8.15e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
835.58	3434.21	151	35	69	260	1.32	2.822e+000
1587.26	6517.02	165	30	58	161	2.15	5.467e+000
1619.58	6649.45	127	24	45	77	2.02	4.284e+000
1629.91	6691.77	156	19	31	35	1.30	5.293e+000

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012898 STS LAKE SHORE EAST MM-66

Sample Size . . . . 9.29e+002 g	Spectrum File . . H:\PCASPEC\012898.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 %	Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50	

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
Ra-223	Average:	1.74e-006	+-1.14e-007	2.74e+002	4 of 7
	83.78	1.41e-006	+-1.68e-007		
	94.90	2.02e-006	+-3.82e-007		
	154.21	2.02e-006	+-4.92e-007		
	269.46	2.02e-006	+-1.82e-007		
U-235	Average:	3.61e-007	+-5.22e-008	6.17e+012	3 of 7
	89.95	2.16e-005	+-1.17e-006		
	93.35	3.22e-006	+-9.60e-007		
	185.72	3.11e-007	+-5.24e-008		
Th-234	Average:	5.30e-006	+-1.12e-006	5.78e+002	2 of 3
	92.38	5.27e-006	+-1.57e-006		
	92.80	5.34e-006	+-1.59e-006		
Pb-212	Average:	1.27e-005	+-9.35e-008	1.06e+001	5 of 5
	74.82	1.28e-005	+-5.22e-007		
	77.11	1.24e-005	+-3.66e-007		
	87.30	1.21e-005	+-5.41e-007		
	238.63	1.28e-005	+-1.01e-007		
	300.09	1.03e-005	+-7.69e-007		
Pb-214	Average:	1.42e-006	+-6.02e-008	4.47e-001	5 of 6
	74.82	1.42e-006	+-8.98e-007		
	77.11	1.42e-006	+-6.30e-007		
	241.98	1.42e-006	+-2.57e-007		
	295.21	1.42e-006	+-1.39e-007		
	351.92	1.42e-006	+-6.97e-008		
Tl-208	Average:	4.36e-006	+-5.05e-008	5.09e-002	5 of 5
	74.97	4.31e-006	+-1.63e-006		
	277.35	3.75e-006	+-3.42e-007		

	510.84	4.72e-006 +-1.56e-007			
	583.14	4.31e-006 +-5.53e-008			
	860.37	4.80e-006 +-2.48e-007			
Pa-234	Average:	1.45e-006 +-1.41e-007	6.70e+000	2 of	14
	94.66	1.45e-006 +-2.73e-007			
	131.20	1.45e-006 +-1.65e-007			
Ra-226	186.10	I.D.Only	1.40e+007	1 of	1
Ac-228	Average:	1.26e-005 +-1.21e-007	6.13e+000	10 of	10
	209.28	1.09e-005 +-6.73e-007			
	270.23	4.30e-006 +-6.89e-007			
	327.64	1.06e-005 +-7.40e-007			
	338.32	1.25e-005 +-2.63e-007			
	409.51	1.12e-005 +-1.16e-006			
	463.00	1.18e-005 +-6.00e-007			
	794.70	1.13e-005 +-6.79e-007			
	911.07	1.31e-005 +-1.97e-007			
	964.60	1.32e-005 +-6.08e-007			
	969.11	1.38e-005 +-2.76e-007			
Ra-224	240.98	1.57e-005 +-4.88e-007	8.69e+001	1 of	1
Bi-212	727.17	7.63e-006 +-3.17e-007	1.01e+000	1 of	2
Bi-211	351.07	8.80e-007 +-2.01e-007	3.55e-002	1 of	1
Bi-214	Average:	1.60e-006 +-6.30e-008	3.32e-001	3 of	7
	609.31	1.48e-006 +-7.03e-008			
	1120.30	1.88e-006 +-1.98e-007			
	1764.50	2.27e-006 +-2.03e-007			
K-40	1460.80	1.05e-005 +-4.20e-007	1.12e+013	1 of	1

TOTAL: 7.62e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
772.11	3173.78	367	55	107	576	1.60	6.393e+000
785.13	3227.20	232	50	99	540	1.51	4.102e+000
835.05	3432.05	367	50	97	469	1.89	6.854e+000
1494.55	6137.08	151	30	58	143	2.12	4.741e+000
1586.79	6515.09	455	35	58	154	2.27	1.507e+001
1591.11	6532.79	282	37	70	191	2.39	9.363e+000
1619.48	6649.02	181	34	65	182	1.94	6.106e+000
1629.39	6689.64	246	35	67	169	1.45	8.344e+000

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012899 STS LAKE SHORE EAST LL-59

```
Sample Size . . . . . . . 9.95e+002 g | Spectrum File . . H:\PCASPEC\012899.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-16-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
-------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
-------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]       02-01-01 12:00
-------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
```

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.14e-007 +-2.07e-008	6.17e+012	1 of 7
Pb-212	Average:	4.68e-007 +-2.59e-008	1.06e+001	2 of 5
	77.11	4.28e-007 +-1.41e-007		
	238.63	4.69e-007 +-2.63e-008		
Pb-214	Average:	7.56e-007 +-2.83e-008	4.47e-001	3 of 6
	241.98	7.12e-007 +-1.21e-007		
	295.21	8.19e-007 +-5.64e-008		
	351.92	7.37e-007 +-3.39e-008		
Tl-208	Average:	1.55e-007 +-1.36e-008	5.09e-002	2 of 5
	510.84	2.17e-007 +-5.19e-008		
	583.14	1.50e-007 +-1.41e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	5.54e-007 +-4.52e-008	6.13e+000	2 of 10
	338.32	4.45e-007 +-8.59e-008		
	911.07	5.96e-007 +-5.31e-008		
Ra-224	240.98	1.35e-006 +-2.30e-007	8.69e+001	1 of 1
Tl-210	298.00	1.99e-007 +-1.37e-008	2.17e-002	1 of 3
Bi-211	351.07	2.12e-006 +-9.76e-008	3.55e-002	1 of 1
Bi-214	Average:	7.61e-007 +-3.15e-008	3.32e-001	3 of 7
	609.31	7.16e-007 +-3.47e-008		
	1120.30	8.79e-007 +-1.20e-007		
	1764.50	1.04e-006 +-9.65e-008		
K-40	1460.80	1.10e-005 +-3.32e-007	1.12e+013	1 of 1

TOTAL: 1.75e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012900 STS LAKE SHORE EAST PP.5-66.5

```
Sample Size . . . . . . . 7.51e+002 g | Spectrum File . . H:\PCASPEC\012900.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-16-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
--------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
--------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]      02-01-01 12:00
--------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
```

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	1.04e-007	+-2.21e-008	6.17e+012	1 of 7
Pb-212	238.63	3.26e-007	+-3.31e-008	1.06e+001	1 of 5
Pb-214	Average:	6.58e-007	+-3.28e-008	4.47e-001	2 of 6
	295.21	6.96e-007	+-6.52e-008		
	351.92	6.45e-007	+-3.79e-008		
Tl-208	583.14	1.37e-007	+-1.61e-008	5.09e-002	1 of 5
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	4.65e-007	+-4.43e-008	6.13e+000	3 of 10
	338.32	4.27e-007	+-9.87e-008		
	911.07	4.48e-007	+-5.76e-008		
	969.11	5.49e-007	+-9.78e-008		
Ra-224	240.98	3.69e-006	+-3.74e-007	8.69e+001	1 of 1
Tl-210	298.00	1.69e-007	+-1.59e-008	2.17e-002	1 of 3
Bi-211	351.07	1.86e-006	+-1.09e-007	3.55e-002	1 of 1
Bi-214	Average:	6.33e-007	+-3.44e-008	3.32e-001	3 of 7
	609.31	6.08e-007	+-3.71e-008		
	1120.30	5.82e-007	+-1.40e-007		
	1764.50	9.43e-007	+-1.20e-007		
K-40	1460.80	1.04e-005	+-3.71e-007	1.12e+013	1 of 1

TOTAL: 1.85e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012901 STS LAKE SHORE EAST OO.5-67

Sample Size . . . . 9.63e+002 g	Spectrum File . . H:\PCASPEC\012901.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	8.21e-008	+-1.75e-008	6.17e+012	1 of 7
Pb-212	238.63	2.64e-007	+-2.83e-008	1.06e+001	1 of 5
Pb-214	Average:	4.20e-007	+-2.60e-008	4.47e-001	2 of 6
	295.21	4.38e-007	+-5.67e-008		
	351.92	4.16e-007	+-2.93e-008		
Tl-208	583.14	1.10e-007	+-1.38e-008	5.09e-002	1 of 5
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	3.65e-007	+-4.17e-008	6.13e+000	2 of 10
	338.32	4.31e-007	+-8.04e-008		
	911.07	3.41e-007	+-4.88e-008		
Ra-224	240.98	2.99e-006	+-3.20e-007	8.69e+001	1 of 1
Tl-210	298.00	1.06e-007	+-1.38e-008	2.17e-002	1 of 3
Bi-211	351.07	1.20e-006	+-8.43e-008	3.55e-002	1 of 1
Bi-214	Average:	4.35e-007	+-2.82e-008	3.32e-001	2 of 7
	609.31	4.08e-007	+-3.03e-008		
	1764.50	6.13e-007	+-7.74e-008		
K-40	1460.80	1.19e-005	+-3.44e-007	1.12e+013	1 of 1

TOTAL: 1.79e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012902 STS LAKE SHORE EAST TT.5-51.5

Sample Size . . . . 8.94e+002 g	Spectrum File . . H:\PCASPEC\012902.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc (uCi/g	+- 1.00sigma)	Halflife (hrs)	Peaks Found
Pb-212	238.63	1.76e-007	+-2.72e-008	1.06e+001	1 of 5
Pb-214	Average:	3.61e-007	+-2.51e-008	4.47e-001	2 of 6
	295.21	3.20e-007	+-5.15e-008		
	351.92	3.74e-007	+-2.87e-008		
Tl-208	583.14	8.74e-008	+-1.28e-008	5.09e-002	1 of 5
Ac-228	911.07	3.06e-007	+-4.36e-008	6.13e+000	1 of 10
Ra-224	240.98	1.98e-006	+-3.07e-007	8.69e+001	1 of 1
Tl-210	298.00	7.77e-008	+-1.25e-008	2.17e-002	1 of 3
Bi-211	351.07	1.08e-006	+-8.24e-008	3.55e-002	1 of 1
Bi-214	609.31	2.99e-007	+-2.75e-008	3.32e-001	1 of 7
K-40	1460.80	6.14e-006	+-2.81e-007	1.12e+013	1 of 1
TOTAL:		1.05e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012903 STS LAKE SHORE EAST SS-50.5 (1')

Sample Size . . . . 1.34e+003 g	Spectrum File . . H:\PCASPEC\012903.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
Pb-212	238.63	1.17e-007	+-1.81e-008	1.06e+001	1 of 5
Pb-214	Average:	2.16e-007	+-1.64e-008	4.47e-001	2 of 6
	295.21	2.91e-007	+-3.40e-008		
	351.92	1.93e-007	+-1.87e-008		
Tl-208	583.14	6.12e-008	+-8.83e-009	5.09e-002	1 of 5
Ac-228	911.07	1.91e-007	+-3.29e-008	6.13e+000	1 of 10
Ra-224	240.98	1.32e-006	+-2.04e-007	8.69e+001	1 of 1
Tl-210	298.00	7.08e-008	+-8.26e-009	2.17e-002	1 of 3
Bi-211	351.07	5.55e-007	+-5.39e-008	3.55e-002	1 of 1
Bi-214	609.31	2.27e-007	+-1.79e-008	3.32e-001	1 of 7
K-40	1460.80	9.17e-006	+-2.60e-007	1.12e+013	1 of 1

TOTAL: 1.19e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology

GDR_C Nuclide Activity Summary

Sample ID: 012904 STS LAKE SHORE EAST SS-50.5 (1')

Sample Size . . . . 9.33e+002 g	Spectrum File . . H:\PCASPEC\012904.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 %	Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50	

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc (uCi/g	+- 1.00sigma)	Halflife (hrs)	Peaks Found
U-235	185.72	7.92e-008	+-1.70e-008	6.17e+012	1 of 7
Pb-212	238.63	2.82e-007	+-2.58e-008	1.06e+001	1 of 5
Pb-214	Average:	3.72e-007	+-2.59e-008	4.47e-001	2 of 6
	295.21	3.73e-007	+-5.14e-008		
	351.92	3.72e-007	+-3.00e-008		
Tl-208	583.14	1.04e-007	+-1.29e-008	5.09e-002	1 of 5
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	3.48e-007	+-3.91e-008	6.13e+000	2 of 10
	338.32	4.09e-007	+-7.70e-008		
	911.07	3.27e-007	+-4.54e-008		
Ra-224	240.98	3.18e-006	+-2.91e-007	8.69e+001	1 of 1
Bi-211	351.07	2.46e-007	+-8.64e-008	3.55e-002	1 of 1
Bi-214	Average:	4.45e-007	+-2.65e-008	3.32e-001	3 of 7
	609.31	4.14e-007	+-2.99e-008		
	1120.30	4.59e-007	+-9.38e-008		
	1764.50	6.19e-007	+-7.18e-008		
K-40	1460.80	7.93e-006	+-3.00e-007	1.12e+013	1 of 1
TOTAL:		1.30e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012905 STS LAKE SHORE EAST TT.5-50 (2'-3

```
Sample Size . . . . . . . 1.05e+003 g | Spectrum File . . H:\PCASPEC\012905.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-16-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
-------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
-------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]      02-01-01 12:00
-------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
```

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
Pb-212	238.63	2.00e-007	+-2.39e-008	1.06e+001	1 of 5
Pb-214	Average:	3.20e-007	+-2.17e-008	4.47e-001	2 of 6
	295.21	3.17e-007	+-4.43e-008		
	351.92	3.21e-007	+-2.49e-008		
Tl-208	583.14	7.46e-008	+-1.14e-008	5.09e-002	1 of 5
Ac-228	338.32	3.39e-007	+-7.03e-008	6.13e+000	1 of 10
Ra-224	240.98	2.26e-006	+-2.70e-007	8.69e+001	1 of 1
Tl-210	298.00	7.70e-008	+-1.08e-008	2.17e-002	1 of 3
Bi-211	351.07	9.23e-007	+-7.15e-008	3.55e-002	1 of 1
Bi-214	609.31	2.51e-007	+-2.38e-008	3.32e-001	1 of 7
K-40	1460.80	7.90e-006	+-2.82e-007	1.12e+013	1 of 1
TOTAL:		1.23e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012906 STS LAKE SHORE EAST SS.5-58.25

Sample Size . . . . 9.60e+002 g	Spectrum File . . H:\PCASPEC\012906.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	8.88e-008	+-1.73e-008	6.17e+012	1 of 7
Pb-212	238.63	2.02e-007	+-2.69e-008	1.06e+001	1 of 5
Pb-214	Average:	4.31e-007	+-2.57e-008	4.47e-001	2 of 6
	295.21	4.94e-007	+-4.86e-008		
	351.92	4.06e-007	+-3.02e-008		
Tl-208	583.14	9.04e-008	+-1.41e-008	5.09e-002	1 of 5
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	911.07	2.32e-007	+-5.06e-008	6.13e+000	1 of 10
Ra-224	240.98	2.29e-006	+-3.04e-007	8.69e+001	1 of 1
Tl-210	298.00	1.20e-007	+-1.18e-008	2.17e-002	1 of 3
Bi-211	351.07	1.17e-006	+-8.69e-008	3.55e-002	1 of 1
Bi-214	Average:	4.29e-007	+-2.72e-008	3.32e-001	2 of 7
	609.31	4.24e-007	+-2.87e-008		
	1120.30	4.82e-007	+-8.68e-008		
K-40	1460.80	9.14e-006	+-3.22e-007	1.12e+013	1 of 1
TOTAL:		1.42e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

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============================================================================
               RSSI High Resolution Gamma Spectroscopy Analysis
============================================================================
                              Quantum Technology
                        GDR_C Nuclide Activity Summary
============================================================================

Sample ID: 012907 STS LAKE SHORE EAST OO.5-51

----------------------------------------------------------------------------
Sample Size . . . . . . . 7.68e+002 g | Spectrum File . . H:\PCASPEC\012907.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-16-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
----------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
----------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]     02-01-01 12:00
----------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
----------------------------------------------------------------------------
----------------------------------------------------------------------------

                         FINAL ACTIVITY REPORT
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Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
Ra-223	94.90	1.23e-006	+-2.51e-007	2.74e+002	1 of 7
U-235	Average:	3.74e-007	+-3.19e-008	6.17e+012	2 of 7
	93.35	3.08e-006	+-6.30e-007		
	185.72	3.67e-007	+-3.19e-008		
Th-234	Average:	5.07e-006	+-7.34e-007	5.78e+002	2 of 3
	92.38	5.04e-006	+-1.03e-006		
	92.80	5.11e-006	+-1.04e-006		
Pb-212	Average:	1.03e-006	+-4.27e-008	1.06e+001	4 of 5
	74.82	1.03e-006	+-2.65e-007		
	77.11	1.03e-006	+-1.89e-007		
	87.30	1.03e-006	+-3.73e-007		
	238.63	1.03e-006	+-4.48e-008		
Pb-214	Average:	2.98e-006	+-5.19e-008	4.47e-001	5 of 6
	74.82	1.75e-006	+-4.57e-007		
	77.11	2.88e-006	+-3.25e-007		
	241.98	3.73e-006	+-2.05e-007		
	295.21	3.00e-006	+-1.04e-007		
	351.92	2.93e-006	+-6.43e-008		
Tl-208	Average:	3.18e-007	+-2.20e-008	5.09e-002	3 of 5
	74.97	3.09e-007	+-8.27e-007		
	510.84	4.13e-007	+-8.58e-008		
	583.14	3.11e-007	+-2.28e-008		
Pa-234	94.66	8.74e-007	+-1.79e-007	6.70e+000	1 of 14
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	1.09e-006	+-6.55e-008	6.13e+000	3 of 10
	338.32	1.07e-006	+-1.44e-007		
	911.07	1.19e-006	+-9.00e-008		

	969.11	9.07e-007 +-1.28e-007			
Ra-224	240.98	7.07e-006 +-3.88e-007	8.69e+001	1 of	1
Tl-210	298.00	7.30e-007 +-2.53e-008	2.17e-002	1 of	3
Bi-211	351.07	8.43e-006 +-1.85e-007	3.55e-002	1 of	1
Bi-214	Average:	2.93e-006 +-5.87e-008	3.32e-001	6 of	7
	609.31	2.84e-006 +-6.55e-008			
	768.36	2.70e-006 +-4.16e-007			
	934.06	2.94e-006 +-6.01e-007			
	1120.30	3.18e-006 +-2.06e-007			
	1238.10	3.60e-006 +-3.98e-007			
	1764.50	3.54e-006 +-2.29e-007			
K-40	1460.80	9.03e-006 +-3.71e-007	1.12e+013	1 of	1

TOTAL: 4.11e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012908 STS LAKE SHORE EAST 00.5-51.5 (7'

Sample Size . . . . 6.58e+002 g | Spectrum File . . H:\PCASPEC\012908.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. 08-16-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	94.90	1.02e-006 +-2.36e-007	2.74e+002	1 of 7
U-235	Average:	2.84e-007 +-3.19e-008	6.17e+012	2 of 7
	93.35	2.57e-006 +-5.93e-007		
	185.72	2.77e-007 +-3.20e-008		
Th-234	Average:	4.24e-006 +-6.91e-007	5.78e+002	2 of 3
	92.38	4.21e-006 +-9.71e-007		
	92.80	4.27e-006 +-9.84e-007		
Pb-212	Average:	8.55e-007 +-4.09e-008	1.06e+001	3 of 5
	74.82	8.57e-007 +-3.08e-007		
	77.11	8.55e-007 +-1.82e-007		
	238.63	8.55e-007 +-4.24e-008		
Pb-214	Average:	2.14e-006 +-4.99e-008	4.47e-001	5 of 6
	74.82	2.36e-006 +-5.30e-007		
	77.11	1.98e-006 +-3.14e-007		
	241.98	2.20e-006 +-2.04e-007		
	295.21	2.20e-006 +-9.85e-008		
	351.92	2.12e-006 +-6.20e-008		
Tl-208	Average:	2.75e-007 +-2.54e-008	5.09e-002	3 of 5
	74.97	2.59e-007 +-9.60e-007		
	510.84	3.95e-007 +-8.27e-008		
	583.14	2.63e-007 +-2.67e-008		
Pa-234	94.66	7.31e-007 +-1.68e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	8.65e-007 +-6.10e-008	6.13e+000	3 of 10
	338.32	9.50e-007 +-1.46e-007		
	911.07	8.26e-007 +-8.20e-008		
	969.11	8.90e-007 +-1.17e-007		

Ra-224	240.98	4.17e-006 +-3.87e-007	8.69e+001	1 of	1
Tl-210	298.00	5.35e-007 +-2.39e-008	2.17e-002	1 of	3
Bi-211	351.07	6.09e-006 +-1.78e-007	3.55e-002	1 of	1
Bi-214	Average:	2.05e-006 +-5.54e-008	3.32e-001	5 of	7
	609.31	1.96e-006 +-6.33e-008			
	768.36	1.96e-006 +-4.17e-007			
	1120.30	2.04e-006 +-1.79e-007			
	1238.10	2.99e-006 +-4.70e-007			
	1764.50	2.55e-006 +-1.68e-007			
K-40	1460.80	7.56e-006 +-4.03e-007	1.12e+013	1 of	1

TOTAL: 3.08e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012909 STS LAKE SHORE EAST OO.5-51.5 (1.

Sample Size . . . . 6.50e+002 g	Spectrum File . . H:\PCASPEC\012909.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
Ra-223	94.90	8.15e-007	+-2.34e-007	2.74e+002	1 of 7
U-235	Average:	2.54e-007	+-3.18e-008	6.17e+012	2 of 7
	93.35	2.05e-006	+-5.88e-007		
	185.72	2.48e-007	+-3.19e-008		
Th-234	Average:	3.37e-006	+-6.85e-007	5.78e+002	2 of 3
	92.38	3.35e-006	+-9.62e-007		
	92.80	3.40e-006	+-9.75e-007		
Pb-212	Average:	9.17e-007	+-4.40e-008	1.06e+001	3 of 5
	74.82	9.17e-007	+-2.55e-007		
	77.11	9.16e-007	+-1.89e-007		
	238.63	9.17e-007	+-4.59e-008		
Pb-214	Average:	1.55e-006	+-4.35e-008	4.47e-001	5 of 6
	74.82	1.86e-006	+-4.40e-007		
	77.11	1.45e-006	+-3.25e-007		
	241.98	1.51e-006	+-1.70e-007		
	295.21	1.57e-006	+-8.75e-008		
	351.92	1.55e-006	+-5.35e-008		
Tl-208	Average:	2.78e-007	+-2.20e-008	5.09e-002	3 of 5
	74.97	2.76e-007	+-7.96e-007		
	510.84	2.52e-007	+-7.78e-008		
	583.14	2.80e-007	+-2.30e-008		
Pa-234	94.66	5.81e-007	+-1.67e-007	6.70e+000	1 of 14
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	9.25e-007	+-6.11e-008	6.13e+000	3 of 10
	338.32	7.52e-007	+-1.42e-007		
	911.07	9.97e-007	+-7.90e-008		
	969.11	6.75e-007	+-1.32e-007		

Ra-224	240.98	2.87e-006	+-3.23e-007	8.69e+001	1 of 1
Tl-210	298.00	3.81e-007	+-2.13e-008	2.17e-002	1 of 3
Bi-211	351.07	4.45e-006	+-1.54e-007	3.55e-002	1 of 1
Bi-214	Average:	1.30e-006	+-4.88e-008	3.32e-001	3 of 7
	609.31	1.25e-006	+-5.31e-008		
	1120.30	1.46e-006	+-1.64e-007		
	1764.50	1.62e-006	+-1.91e-007		
K-40	1460.80	9.54e-006	+-4.23e-007	1.12e+013	1 of 1
TOTAL:		2.72e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012910 STS LAKE SHORE EAST PP-51

Sample Size . . . . 7.95e+002 g	Spectrum File . . H:\PCASPEC\012910.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
Pb-212	238.63	5.45e-007	+-3.17e-008	1.06e+001	1 of 5
Pb-214	Average:	6.52e-007	+-3.16e-008	4.47e-001	3 of 6
	241.98	1.07e-006	+-1.47e-007		
	295.21	6.74e-007	+-6.38e-008		
	351.92	6.17e-007	+-3.75e-008		
Tl-208	Average:	1.75e-007	+-1.54e-008	5.09e-002	2 of 5
	510.84	2.14e-007	+-6.48e-008		
	583.14	1.72e-007	+-1.59e-008		
Ac-228	Average:	5.69e-007	+-4.59e-008	6.13e+000	3 of 10
	338.32	6.16e-007	+-9.61e-008		
	911.07	5.47e-007	+-6.04e-008		
	969.11	5.80e-007	+-1.05e-007		
Ra-224	240.98	2.02e-006	+-2.78e-007	8.69e+001	1 of 1
Tl-210	298.00	1.64e-007	+-1.55e-008	2.17e-002	1 of 3
Bi-211	351.07	1.77e-006	+-1.08e-007	3.55e-002	1 of 1
Bi-214	Average:	7.51e-007	+-3.52e-008	3.32e-001	2 of 7
	609.31	7.33e-007	+-3.71e-008		
	1764.50	9.22e-007	+-1.13e-007		
K-40	1460.80	9.09e-006	+-3.63e-007	1.12e+013	1 of 1

TOTAL: 1.57e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

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None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012911 STS LAKE SHORE EAST 00-51 (2')

Sample Size . . . . 8.44e+002 g	Spectrum File . . H:\PCASPEC\012911.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	1.44e-007	+-2.38e-008	6.17e+012	1 of 7
Pb-212	Average:	9.71e-007	+-3.39e-008	1.06e+001	3 of 5
	74.82	9.72e-007	+-2.16e-007		
	77.11	9.71e-007	+-1.61e-007		
	238.63	9.71e-007	+-3.52e-008		
Pb-214	Average:	1.19e-006	+-3.66e-008	4.47e-001	5 of 6
	74.82	8.34e-007	+-3.71e-007		
	77.11	1.06e-006	+-2.76e-007		
	241.98	1.77e-006	+-1.58e-007		
	295.21	1.16e-006	+-7.21e-008		
	351.92	1.16e-006	+-4.49e-008		
Tl-208	Average:	2.74e-007	+-1.92e-008	5.09e-002	3 of 5
	74.97	2.80e-007	+-6.72e-007		
	510.84	2.63e-007	+-6.90e-008		
	583.14	2.75e-007	+-2.01e-008		
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	1.05e-006	+-5.19e-008	6.13e+000	3 of 10
	338.32	1.03e-006	+-1.13e-007		
	911.07	1.09e-006	+-7.01e-008		
	969.11	9.82e-007	+-1.06e-007		
Ra-224	240.98	3.35e-006	+-2.99e-007	8.69e+001	1 of 1
Tl-210	298.00	2.81e-007	+-1.75e-008	2.17e-002	1 of 3
Bi-211	351.07	3.33e-006	+-1.29e-007	3.55e-002	1 of 1
Bi-214	Average:	1.14e-006	+-3.97e-008	3.32e-001	3 of 7
	609.31	1.11e-006	+-4.32e-008		
	1120.30	1.10e-006	+-1.41e-007		
	1764.50	1.47e-006	+-1.44e-007		

K-40	1460.80	8.98e-006	+-3.50e-007	1.12e+013	1 of 1

TOTAL: 2.07e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012912 STS LAKE SHORE EAST OO-51 (7')

Sample Size . . . . 8.67e+002 g	Spectrum File . . H:\PCASPEC\012912.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	2.16e-007 +-2.59e-008	6.17e+012	1 of 7
Pb-212	Average:	9.94e-007 +-3.43e-008	1.06e+001	3 of 5
	74.82	9.96e-007 +-2.15e-007		
	77.11	9.95e-007 +-1.50e-007		
	238.63	9.94e-007 +-3.58e-008		
Pb-214	Average:	1.39e-006 +-3.57e-008	4.47e-001	5 of 6
	74.82	1.45e-006 +-3.70e-007		
	77.11	1.62e-006 +-2.58e-007		
	241.98	1.84e-006 +-1.54e-007		
	295.21	1.31e-006 +-7.11e-008		
	351.92	1.38e-006 +-4.38e-008		
Tl-208	Average:	3.25e-007 +-1.85e-008	5.09e-002	3 of 5
	74.97	3.15e-007 +-6.70e-007		
	510.84	4.85e-007 +-6.62e-008		
	583.14	3.11e-007 +-1.92e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	9.75e-007 +-5.47e-008	6.13e+000	3 of 10
	338.32	8.30e-007 +-1.18e-007		
	911.07	1.06e-006 +-7.31e-008		
	969.11	9.00e-007 +-1.15e-007		
Ra-224	240.98	3.49e-006 +-2.91e-007	8.69e+001	1 of 1
Tl-210	298.00	3.17e-007 +-1.73e-008	2.17e-002	1 of 3
Bi-212	727.17	8.62e-007 +-1.19e-007	1.01e+000	1 of 2
Bi-211	351.07	3.96e-006 +-1.26e-007	3.55e-002	1 of 1
Bi-214	Average:	1.27e-006 +-4.03e-008	3.32e-001	3 of 7
	609.31	1.24e-006 +-4.44e-008		
	1120.30	1.43e-006 +-1.37e-007		

	1764.50	1.42e-006 +-1.33e-007		
K-40	1460.80	8.70e-006 +-3.47e-007	1.12e+013	1 of 1
TOTAL:		2.25e-005 uCi/g		

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012913 STS LAKE SHORE EAST NN.5-51

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Sample Size . . . . . . . 8.56e+002 g | Spectrum File . . H:\PCASPEC\012913.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-16-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
-------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
-------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]     02-01-01 12:00
-------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
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FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	1.01e-007	+-2.08e-008	6.17e+012	1 of 7
Pb-212	Average:	4.78e-007	+-2.86e-008	1.06e+001	2 of 5
	77.11	4.19e-007	+-1.31e-007		
	238.63	4.81e-007	+-2.93e-008		
Pb-214	Average:	8.55e-007	+-3.10e-008	4.47e-001	3 of 6
	241.98	1.24e-006	+-1.44e-007		
	295.21	9.12e-007	+-6.13e-008		
	351.92	8.09e-007	+-3.71e-008		
Tl-208	Average:	1.53e-007	+-1.62e-008	5.09e-002	2 of 5
	510.84	2.72e-007	+-5.69e-008		
	583.14	1.43e-007	+-1.69e-008		
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	5.01e-007	+-5.00e-008	6.13e+000	2 of 10
	338.32	4.28e-007	+-9.26e-008		
	911.07	5.31e-007	+-5.93e-008		
Ra-224	240.98	2.35e-006	+-2.74e-007	8.69e+001	1 of 1
Tl-210	298.00	2.22e-007	+-1.49e-008	2.17e-002	1 of 3
Bi-211	351.07	2.33e-006	+-1.07e-007	3.55e-002	1 of 1
Bi-214	Average:	8.78e-007	+-3.42e-008	3.32e-001	3 of 7
	609.31	8.43e-007	+-3.72e-008		
	1120.30	1.04e-006	+-1.37e-007		
	1764.50	1.10e-006	+-1.14e-007		
K-40	1460.80	1.18e-005	+-3.84e-007	1.12e+013	1 of 1

TOTAL: 1.96e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

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RSSI High Resolution Gamma Spectroscopy Analysis

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Quantum Technology

GDR_C Nuclide Activity Summary

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Sample ID: 012914 STS LAKE SHORE EAST OO.5-50.5 (1.5')

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Sample Size . . . . 7.79e+002 g | Spectrum File . .
H:\PCASPEC\012914.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. 08-16-01
00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000
Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF]. . . . . 0.00e+000
Hrs

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Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . .
H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series +
K

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Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01
12:00

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Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000
Halflives
Library Energy Tolerance. . . 2.50

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FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	7.62e-008	+-2.48e-008	6.17e+012	1 of 7
Pb-212	Average:	7.56e-007	+-3.43e-008	1.06e+001	3 of 5
	74.82	7.56e-007	+-2.00e-007		
	77.11	7.55e-007	+-1.44e-007		
	238.63	7.56e-007	+-3.59e-008		
Pb-214	Average:	9.92e-007	+-3.41e-008	4.47e-001	4 of 6
	77.11	8.91e-007	+-2.48e-007		
	241.98	1.32e-006	+-1.57e-007		
	295.21	1.10e-006	+-6.59e-008		

	351.92	9.28e-007 +-4.17e-008			
Tl-208	Average:	2.67e-007 +-1.80e-008	5.09e-002	3 of	5
	74.97	2.56e-007 +-6.23e-007			
	510.84	3.70e-007 +-6.24e-008			
	583.14	2.58e-007 +-1.88e-008			
Ra-226	186.10	I.D.Only	1.40e+007	1 of	1
Ac-228	Average:	6.83e-007 +-5.03e-008	6.13e+000	3 of	10
	338.32	6.98e-007 +-1.03e-007			
	911.07	6.67e-007 +-6.77e-008			
	969.11	7.08e-007 +-1.09e-007			
Ra-224	240.98	2.51e-006 +-2.97e-007	8.69e+001	1 of	1
Tl-210	298.00	2.68e-007 +-1.60e-008	2.17e-002	1 of	3
Bi-212	727.17	7.95e-007 +-1.08e-007	1.01e+000	1 of	2
Bi-211	351.07	2.67e-006 +-1.20e-007	3.55e-002	1 of	1
Bi-214	Average:	8.47e-007 +-3.86e-008	3.32e-001	3 of	7
	609.31	8.45e-007 +-4.19e-008			
	1120.30	8.72e-007 +-1.39e-007			
	1764.50	8.37e-007 +-1.39e-007			
K-40	1460.80	8.07e-006 +-3.70e-007	1.12e+013	1 of	1

TOTAL: 1.79e-005 uCi/g

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UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

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None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012915 STS LAKE SHORE EAST OO.5-52.5 (1.

Sample Size . . . . 6.65e+002 g	Spectrum File . . H:\PCASPEC\012915.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 %	Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50	

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.42e-007 +-2.92e-008	6.17e+012	1 of 7
Pb-212	Average:	7.56e-007 +-3.90e-008	1.06e+001	3 of 5
	74.82	7.57e-007 +-2.41e-007		
	77.11	7.55e-007 +-1.76e-007		
	238.63	7.56e-007 +-4.05e-008		
Pb-214	Average:	9.81e-007 +-3.78e-008	4.47e-001	5 of 6
	74.82	1.05e-006 +-4.14e-007		
	77.11	7.14e-007 +-3.03e-007		
	241.98	1.39e-006 +-1.66e-007		
	295.21	1.06e-006 +-7.56e-008		
	351.92	9.27e-007 +-4.60e-008		
Tl-208	Average:	2.42e-007 +-2.07e-008	5.09e-002	3 of 5
	74.97	2.43e-007 +-7.50e-007		
	510.84	2.97e-007 +-7.62e-008		
	583.14	2.38e-007 +-2.15e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	7.06e-007 +-5.52e-008	6.13e+000	3 of 10
	338.32	7.53e-007 +-1.18e-007		
	911.07	6.78e-007 +-7.37e-008		
	969.11	7.30e-007 +-1.17e-007		
Ra-224	240.98	2.63e-006 +-3.15e-007	8.69e+001	1 of 1
Tl-210	298.00	2.57e-007 +-1.84e-008	2.17e-002	1 of 3
Bi-211	351.07	2.67e-006 +-1.32e-007	3.55e-002	1 of 1
Bi-214	Average:	1.02e-006 +-4.00e-008	3.32e-001	3 of 7
	609.31	9.93e-007 +-4.42e-008		
	1120.30	1.09e-006 +-1.28e-007		
	1764.50	1.18e-006 +-1.40e-007		

K-40	1460.80	8.88e-006	+-4.26e-007	1.12e+013	1 of 1

TOTAL: 1.83e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012916 STS LAKE SHORE EAST PP-59 (12")

Sample Size . . . . 7.60e+002 g	Spectrum File . . H:\PCASPEC\012916.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-16-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	1.20e-007	+-2.45e-008	6.17e+012	1 of 7
Pb-212	Average:	5.86e-007	+-2.91e-008	1.06e+001	3 of 5
	74.82	5.87e-007	+-2.18e-007		
	77.11	5.85e-007	+-1.34e-007		
	238.63	5.86e-007	+-3.00e-008		
Pb-214	Average:	1.03e-006	+-3.52e-008	4.47e-001	5 of 6
	74.82	1.13e-006	+-3.75e-007		
	77.11	7.39e-007	+-2.30e-007		
	241.98	1.38e-006	+-1.59e-007		
	295.21	9.89e-007	+-6.80e-008		
	351.92	1.03e-006	+-4.37e-008		
Tl-208	Average:	1.60e-007	+-1.81e-008	5.09e-002	3 of 5
	74.97	1.49e-007	+-6.79e-007		
	510.84	2.62e-007	+-7.04e-008		
	583.14	1.53e-007	+-1.88e-008		
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	6.90e-007	+-5.46e-008	6.13e+000	2 of 10
	338.32	6.83e-007	+-1.08e-007		
	911.07	6.92e-007	+-6.34e-008		
Ra-224	240.98	2.61e-006	+-3.02e-007	8.69e+001	1 of 1
Tl-210	298.00	2.40e-007	+-1.65e-008	2.17e-002	1 of 3
Bi-211	351.07	2.97e-006	+-1.26e-007	3.55e-002	1 of 1
Bi-214	Average:	1.02e-006	+-3.92e-008	3.32e-001	3 of 7
	609.31	9.98e-007	+-4.23e-008		
	1120.30	9.68e-007	+-1.61e-007		
	1764.50	1.23e-006	+-1.36e-007		
K-40	1460.80	9.25e-006	+-3.71e-007	1.12e+013	1 of 1

TOTAL: 1.87e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

SOUTHERN AREA LABORATORY ANALYSIS

Boring Number	Location	Sample Depth (feet)	Pb-214 [1] pCi/g	Ac-228 [2] pCi/g	Total Radium [3] pCi/g
B-1	E-51.75	2' - 5'	1.05	0.94	1.99
B-2	G-49.5	4'	1.12	1.08	2.20
B-2	G-49.5	7'	1.15	0.89	2.04
B-3	G.5-50.5	1'	65.6	36.3	101.8
B-3	G.5-50.5	8' - 9'	78.0	36.6	114.6
B-4	G.5-51.5	1'	15.4	86.8	102.2
B-5	F.5-51.5	1'	1.32	1.16	2.48
B-5	F.5-51.5	6' - 7'	1.52	0.95	2.47
B-6	D.75-52.75	1'	0.86	0.68	1.54
B-6	D.75-52.75	9'	1.11	0.68	1.79
B-7	C.5-52.5	1'	0.69	0.56	1.25
B-7	C.5-52.5	3'	0.36	0.32	0.68
B-3A	H.5-49.75	6'	1.09	0.94	2.03
B-3A	H.5-49.75	3.5' - 4.5'	1.46	1.07	2.53
B-4A	G.5-52	1' - 2'	0.42	0.44	0.86
B-4A	G.5-52	6'	0.74	0.44	1.18
B-4B	G.5-52.75	3"	0.86	0.68	1.54
B-4B	G.5-52.75	5' - 6'	0.79	0.57	1.36
B-4/8	J-52.5	1' - 2'	0.73	0.38	1.11
B-4/8	J-52.5	6'	1.31	0.48	1.79
B-5A	F.5-52	1'	1.01	1.11	2.12
B-5A	F.5-52	6'	1.07	0.80	1.87
B-8A	I.25-51.5	3' - 4'	2.09	7.28	9.37
B-8A	I.25-51.5	6'	1.41	2.09	3.50
B-8B	J-51.5	1'	0.87	0.50	1.37
B-8B	J-51.5	6'	1.04	0.89	1.93
B-8	H.5-51.5	3.5' - 4'	0.76	0.56	1.32
B-8	H.5-51.5	6'	2.20	9.71	11.91
B-9	F-50.5	1'	1.41	1.54	2.95
B-9	F-50.5	7'	1.24	0.96	2.20

Highlighted samples exceed USEPA cleanup level.

1 Pb-214 is surrogate for Ra-226
2 Ac-228 is surrogate for Ra-228
3 Total Radium is Ra-226 plus Ra-228

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012824 STS LAKE SHORE EAST B1 2'-5'

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Sample Size . . . . . . . 6.38e+002 g | Spectrum File . . h:\pcaspec\012824.spm
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . .  08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
-------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
-------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]     02-01-01 12:00
-------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
```

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	1.59e-007	+-2.71e-008	6.17e+012	1 of 7
Pb-212	Average:	8.60e-007	+-4.15e-008	1.06e+001	3 of 5
	74.82	8.80e-007	+-2.43e-007		
	77.11	5.48e-007	+-1.63e-007		
	238.63	8.82e-007	+-4.36e-008		
Pb-214	Average:	1.05e-006	+-4.02e-008	4.47e-001	5 of 6
	74.82	1.05e-006	+-4.19e-007		
	77.11	1.05e-006	+-2.81e-007		
	241.98	1.05e-006	+-1.65e-007		
	295.21	1.05e-006	+-8.74e-008		
	351.92	1.05e-006	+-4.80e-008		
Tl-208	Average:	2.79e-007	+-2.34e-008	5.09e-002	2 of 5
	74.97	2.24e-007	+-7.58e-007		
	583.14	2.79e-007	+-2.34e-008		
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	9.35e-007	+-6.21e-008	6.13e+000	3 of 10
	338.32	9.16e-007	+-1.21e-007		
	911.07	8.76e-007	+-8.68e-008		
	969.11	1.09e-006	+-1.31e-007		
Ra-224	240.98	6.23e-007	+-3.14e-007	8.69e+001	1 of 1
Bi-211	351.07	2.75e-007	+-1.38e-007	3.55e-002	1 of 1
Bi-214	Average:	1.00e-006	+-4.55e-008	3.32e-001	3 of 7
	609.31	9.61e-007	+-4.92e-008		
	1120.30	1.04e-006	+-1.76e-007		
	1764.50	1.40e-006	+-1.63e-007		
K-40	1460.80	1.62e-005	+-5.20e-007	1.12e+013	1 of 1

TOTAL: 2.14e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012825 STS LAKE SHORE EAST B2 4'

Sample Size . . . . 4.97e+002 g | Spectrum File . . H:\PCASPEC\012825.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. 08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.83e-007 +-3.74e-008	6.17e+012	1 of 7
Pb-212	Average:	1.10e-006 +-4.60e-008	1.06e+001	3 of 5
	74.82	1.10e-006 +-2.92e-007		
	77.11	1.10e-006 +-1.85e-007		
	238.63	1.10e-006 +-4.81e-008		
Pb-214	Average:	1.12e-006 +-4.82e-008	4.47e-001	5 of 6
	74.82	1.12e-006 +-5.02e-007		
	77.11	1.12e-006 +-3.19e-007		
	241.98	1.12e-006 +-2.23e-007		
	295.21	1.12e-006 +-9.62e-008		
	351.92	1.12e-006 +-5.89e-008		
Tl-208	Average:	2.93e-007 +-2.64e-008	5.09e-002	3 of 5
	74.97	2.88e-007 +-9.10e-007		
	510.84	3.21e-007 +-9.52e-008		
	583.14	2.90e-007 +-2.75e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	1.08e-006 +-7.83e-008	6.13e+000	3 of 10
	338.32	1.20e-006 +-1.62e-007		
	911.07	1.06e-006 +-1.05e-007		
	969.11	9.76e-007 +-1.70e-007		
Ra-224	240.98	1.67e-006 +-4.23e-007	8.69e+001	1 of 1
Bi-211	351.07	3.16e-007 +-1.69e-007	3.55e-002	1 of 1
Bi-214	Average:	1.10e-006 +-5.32e-008	3.32e-001	3 of 7
	609.31	1.07e-006 +-5.90e-008		
	1120.30	1.38e-006 +-1.66e-007		
	1764.50	1.10e-006 +-1.83e-007		
K-40	1460.80	5.78e-006 +-4.40e-007	1.12e+013	1 of 1

TOTAL: 1.26e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012826 STS LAKE SHORE EAST B2 7'

Sample Size . . . . 6.42e+002 g	Spectrum File . . H:\PCASPEC\012826.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-14-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.27e-007 +-2.99e-008	6.17e+012	1 of 7
Pb-212	Average:	8.69e-007 +-3.76e-008	1.06e+001	3 of 5
	74.82	8.71e-007 +-2.50e-007		
	77.11	8.69e-007 +-1.67e-007		
	238.63	8.69e-007 +-3.91e-008		
Pb-214	Average:	1.15e-006 +-4.11e-008	4.47e-001	5 of 6
	74.82	1.17e-006 +-4.30e-007		
	77.11	1.17e-006 +-2.88e-007		
	241.98	1.17e-006 +-1.85e-007		
	295.21	1.17e-006 +-8.43e-008		
	351.92	1.14e-006 +-4.97e-008		
Tl-208	Average:	2.61e-007 +-2.26e-008	5.09e-002	3 of 5
	74.97	2.52e-007 +-7.78e-007		
	510.84	2.84e-007 +-8.33e-008		
	583.14	2.60e-007 +-2.35e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	8.87e-007 +-6.08e-008	6.13e+000	3 of 10
	338.32	8.90e-007 +-1.39e-007		
	911.07	9.38e-007 +-7.86e-008		
	969.11	7.39e-007 +-1.32e-007		
Ra-224	240.98	1.34e-006 +-3.50e-007	8.69e+001	1 of 1
Bi-214	Average:	1.12e-006 +-4.87e-008	3.32e-001	3 of 7
	609.31	1.08e-006 +-5.43e-008		
	1120.30	1.01e-006 +-1.69e-007		
	1764.50	1.48e-006 +-1.44e-007		
K-40	1460.80	9.45e-006 +-4.21e-007	1.12e+013	1 of 1

TOTAL: 1.52e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012827 STS LAKE SHORE EAST B3 1'

Sample Size . . . . 5.60e+002 g	Spectrum File . . H:\PCASPEC\012827.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-14-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 %	Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50	

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	Average:	5.56e-006 +-3.36e-007	2.74e+002	4 of 7
	83.78	4.25e-006 +-5.08e-007		
	94.90	6.58e-006 +-1.06e-006		
	154.21	6.57e-006 +-1.57e-006		
	269.46	6.57e-006 +-5.22e-007		
U-235	Average:	8.45e-006 +-1.55e-007	6.17e+012	3 of 7
	89.95	8.51e-005 +-3.21e-006		
	93.35	2.72e-005 +-2.67e-006		
	185.72	8.21e-006 +-1.56e-007		
Th-234	Average:	4.11e-005 +-2.72e-006	5.78e+002	3 of 3
	63.29	2.88e-005 +-5.67e-006		
	92.38	4.45e-005 +-4.36e-006		
	92.80	4.51e-005 +-4.42e-006		
U-238	66.38	1.13e-003 +-2.23e-004	3.91e+013	1 of 1
Pb-212	Average:	3.62e-005 +-2.23e-007	1.06e+001	5 of 5
	74.82	3.65e-005 +-1.52e-006		
	77.11	3.28e-005 +-1.04e-006		
	87.30	3.65e-005 +-1.49e-006		
	238.63	3.65e-005 +-2.35e-007		
	300.09	3.06e-005 +-2.29e-006		
Pb-214	Average:	6.56e-005 +-2.73e-007	4.47e-001	6 of 6
	74.82	6.60e-005 +-2.62e-006		
	77.11	6.60e-005 +-1.79e-006		
	87.30	4.10e-005 +-2.56e-006		
	241.98	6.60e-005 +-1.03e-006		
	295.21	6.60e-005 +-5.41e-007		
	351.92	6.58e-005 +-3.44e-007		

Tl-208	Average:	1.17e-005 +-1.24e-007	5.09e-002	5 of	5
	74.97	1.16e-005 +-4.75e-006			
	277.35	6.60e-006 +-9.94e-007			
	510.84	1.32e-005 +-4.12e-007			
	583.14	1.16e-005 +-1.34e-007			
	860.37	1.38e-005 +-6.95e-007			
Pa-234	Average:	4.33e-006 +-3.78e-007	6.70e+000	2 of	14
	94.66	4.33e-006 +-7.57e-007			
	131.20	4.33e-006 +-4.36e-007			
Ra-226	186.10	I.D.Only	1.40e+007	1 of	1
Ac-228	Average:	3.63e-005 +-3.18e-007	6.13e+000	10 of	10
	209.28	3.11e-005 +-1.87e-006			
	270.23	1.13e-005 +-1.97e-006			
	327.64	2.94e-005 +-2.16e-006			
	338.32	3.63e-005 +-7.45e-007			
	409.51	3.66e-005 +-3.77e-006			
	463.00	3.48e-005 +-1.70e-006			
	794.70	3.11e-005 +-1.84e-006			
	911.07	3.73e-005 +-4.87e-007			
	964.60	4.18e-005 +-1.67e-006			
	969.11	3.88e-005 +-6.95e-007			
Ra-224	240.98	3.54e-005 +-1.95e-006	8.69e+001	1 of	1
Bi-212	727.17	2.37e-005 +-7.86e-007	1.01e+000	1 of	2
Bi-214	Average:	6.17e-005 +-3.03e-007	3.32e-001	7 of	7
	609.31	5.97e-005 +-3.49e-007			
	768.36	5.77e-005 +-2.03e-006			
	934.06	6.11e-005 +-2.84e-006			
	1120.30	6.44e-005 +-9.52e-007			
	1238.10	6.45e-005 +-1.96e-006			
	1377.70	7.56e-005 +-3.13e-006			
	1764.50	7.63e-005 +-1.09e-006			
Po-210	803.10	6.93e-002 +-7.33e-003	3.32e+003	1 of	1
Po-216	804.90	4.23e-002 +-4.48e-003	4.06e-005	1 of	1
K-40	1460.80	1.73e-005 +-1.03e-006	1.12e+013	1 of	1

TOTAL: 1.13e-001 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
105.84	440.60	1075	261	523	16815	1.32	7.913e+000
259.21	1069.51	729	194	392	8917	1.02	5.148e+000
562.63	2314.21	469	122	250	3005	0.97	6.179e+000
665.17	2734.96	1153	116	233	2400	1.82	1.760e+001
771.45	3171.05	325	94	192	1744	1.63	5.657e+000
785.29	3227.88	1150	99	192	1855	1.75	2.034e+001
835.21	3432.70	585	80	158	1223	1.66	1.093e+001
838.93	3447.97	941	85	165	1285	2.51	1.765e+001
1154.19	4741.45	897	84	166	1134	1.83	2.236e+001
1279.87	5256.91	631	75	149	914	1.67	1.725e+001
1384.03	5684.02	297	82	173	941	1.89	8.706e+000
1400.23	5750.44	670	72	144	711	2.37	1.984e+001
1406.80	5777.37	1142	79	153	765	2.40	3.397e+001
1507.75	6191.18	888	75	146	873	2.43	2.810e+001

1586.73	6514.85	795	65	122	617	2.03	2.633e+001
1591.65	6535.01	426	65	130	664	1.97	1.415e+001
1619.18	6647.79	302	60	121	599	1.94	1.019e+001
1629.22	6688.93	466	53	103	415	2.40	1.580e+001
1659.67	6813.68	466	54	104	425	1.85	1.607e+001
1728.17	7094.25	1468	59	95	359	2.55	5.248e+001
1846.01	7576.71	852	57	104	411	2.16	3.231e+001

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012828 STS LAKE SHORE EAST B3 8'-9'

Sample Size . . . . 7.01e+002 g	Spectrum File . . H:\PCASPEC\012828.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-14-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	Average:	6.08e-006 +-3.18e-007	2.74e+002	4 of 7
	83.78	4.70e-006 +-4.60e-007		
	94.90	7.35e-006 +-9.30e-007		
	154.21	7.35e-006 +-1.49e-006		
	269.46	7.35e-006 +-5.31e-007		
U-235	Average:	8.03e-006 +-1.55e-007	6.17e+012	3 of 7
	89.95	9.20e-005 +-3.38e-006		
	93.35	1.45e-005 +-2.34e-006		
	185.72	7.83e-006 +-1.56e-007		
Th-234	Average:	2.39e-005 +-2.72e-006	5.78e+002	2 of 3
	92.38	2.38e-005 +-3.82e-006		
	92.80	2.41e-005 +-3.87e-006		
Pb-212	Average:	3.70e-005 +-2.15e-007	1.06e+001	5 of 5
	74.82	3.75e-005 +-1.32e-006		
	77.11	2.95e-005 +-9.85e-007		
	87.30	3.75e-005 +-1.47e-006		
	238.63	3.75e-005 +-2.27e-007		
	300.09	3.09e-005 +-2.11e-006		
Pb-214	Average:	7.80e-005 +-2.69e-007	4.47e-001	6 of 6
	74.82	7.30e-005 +-2.27e-006		
	77.11	7.85e-005 +-1.70e-006		
	87.30	4.09e-005 +-2.53e-006		
	241.98	7.85e-005 +-1.01e-006		
	295.21	7.85e-005 +-5.36e-007		
	351.92	7.85e-005 +-3.40e-007		
Tl-208	Average:	1.19e-005 +-1.19e-007	5.09e-002	4 of 5
	277.35	8.22e-006 +-1.02e-006		

	510.84	1.36e-005 +-3.74e-007				
	583.14	1.17e-005 +-1.29e-007				
	860.37	1.35e-005 +-7.14e-007				
Pa-234	Average:	3.41e-006 +-3.60e-007	6.70e+000	2	of	14
	94.66	3.41e-006 +-6.64e-007				
	131.20	3.41e-006 +-4.28e-007				
Ra-226	186.10	I.D.Only	1.40e+007	1	of	1
Ac-228	Average:	3.66e-005 +-2.99e-007	6.13e+000	10	of	10
	209.28	3.32e-005 +-1.76e-006				
	270.23	8.59e-006 +-2.01e-006				
	327.64	2.91e-005 +-2.11e-006				
	338.32	3.61e-005 +-6.93e-007				
	409.51	2.97e-005 +-3.32e-006				
	463.00	3.73e-005 +-1.69e-006				
	794.70	3.17e-005 +-1.75e-006				
	911.07	3.74e-005 +-4.47e-007				
	964.60	4.12e-005 +-1.67e-006				
	969.11	4.00e-005 +-6.79e-007				
Ra-224	240.98	3.90e-005 +-1.91e-006	8.69e+001	1	of	1
Bi-212	727.17	2.38e-005 +-7.38e-007	1.01e+000	1	of	2
Bi-211	351.07	1.78e-006 +-9.77e-007	3.55e-002	1	of	1
Bi-214	Average:	7.49e-005 +-3.00e-007	3.32e-001	7	of	7
	609.31	7.27e-005 +-3.48e-007				
	768.36	7.02e-005 +-1.98e-006				
	934.06	7.43e-005 +-2.78e-006				
	1120.30	7.75e-005 +-9.16e-007				
	1238.10	7.74e-005 +-1.95e-006				
	1377.70	8.90e-005 +-3.05e-006				
	1764.50	9.10e-005 +-1.06e-006				
Po-216	804.90	5.23e-002 +-4.41e-003	4.06e-005	1	of	1
K-40	1460.80	1.39e-005 +-1.00e-006	1.12e+013	1	of	1

TOTAL: 5.27e-002 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
259.16	1069.28	1338	270	552	15316	1.02	9.447e+000
487.08	2004.24	679	157	322	4995	1.82	7.892e+000
562.08	2311.98	513	145	298	4267	1.52	6.753e+000
665.20	2735.10	1791	142	284	3571	1.76	2.734e+001
702.67	2888.83	590	141	292	3767	1.51	9.454e+000
771.82	3172.57	727	88	169	1693	2.08	1.266e+001
785.35	3228.09	1798	126	249	2848	1.92	3.180e+001
835.13	3432.38	673	85	165	1508	1.66	1.257e+001
838.90	3447.83	1310	121	244	2421	2.87	2.456e+001
1154.17	4741.33	1542	93	177	1388	1.99	3.843e+001
1279.88	5256.98	1008	88	172	1261	2.40	2.755e+001
1384.22	5684.81	438	101	214	1430	1.89	1.284e+001
1400.30	5750.73	849	98	201	1277	1.89	2.515e+001
1406.82	5777.48	1617	93	179	1106	2.20	4.809e+001
1507.96	6192.06	1295	97	191	1442	2.04	4.098e+001
1586.83	6515.25	1054	81	157	909	1.97	3.491e+001
1591.42	6534.08	653	76	151	872	2.86	2.169e+001

1619.28	6648.21	394	73	149	905	1.70	1.329e+001
1629.43	6689.80	472	70	142	798	2.09	1.601e+001
1659.88	6814.55	581	63	122	633	2.25	2.004e+001
1728.25	7094.56	2355	76	124	570	2.40	8.420e+001
1846.00	7576.64	1477	65	110	464	2.49	5.601e+001

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012829 STS LAKE SHORE EAST B4 1'

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Sample Size . . . . . . . 5.28e+002 g | Spectrum File . . H:\PCASPEC\012829.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
-------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
-------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]      02-01-01 12:00
-------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .  8.000 Halflives
Library Energy Tolerance. . .  2.50
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FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	Average:	8.99e-006 +-3.91e-007	2.74e+002	4 of 7
	83.78	6.86e-006 +-5.79e-007		
	94.90	1.08e-005 +-1.18e-006		
	154.21	1.08e-005 +-1.51e-006		
	269.46	1.08e-005 +-6.47e-007		
U-235	Average:	2.66e-006 +-1.58e-007	6.17e+012	3 of 7
	89.95	1.59e-004 +-4.06e-006		
	93.35	4.76e-005 +-2.97e-006		
	185.72	2.30e-006 +-1.58e-007		
Th-234	Average:	7.84e-005 +-3.46e-006	5.78e+002	2 of 3
	92.38	7.79e-005 +-4.86e-006		
	92.80	7.90e-005 +-4.93e-006		
Pb-212	Average:	8.29e-005 +-3.12e-007	1.06e+001	5 of 5
	74.82	8.32e-005 +-1.60e-006		
	77.11	8.12e-005 +-1.08e-006		
	87.30	8.32e-005 +-1.67e-006		
	238.63	8.32e-005 +-3.43e-007		
	300.09	7.52e-005 +-2.32e-006		
Pb-214	Average:	1.54e-005 +-2.03e-007	4.47e-001	6 of 6
	74.82	1.55e-005 +-2.75e-006		
	77.11	1.55e-005 +-1.85e-006		
	87.30	1.93e-006 +-2.87e-006		
	241.98	1.55e-005 +-8.46e-007		
	295.21	1.55e-005 +-4.58e-007		
	351.92	1.55e-005 +-2.38e-007		
Tl-208	Average:	2.77e-005 +-1.71e-007	5.09e-002	5 of 5
	74.97	2.74e-005 +-4.98e-006		

	277.35	2.48e-005 +-1.61e-006				
	510.84	2.86e-005 +-5.16e-007				
	583.14	2.74e-005 +-1.87e-007				
	860.37	3.21e-005 +-7.88e-007				
Pa-234	Average:	5.37e-006 +-3.17e-007	6.70e+000	4	of	14
	94.66	2.29e-006 +-8.44e-007				
	98.44	2.29e-006 +-6.20e-007				
	111.00	3.81e-006 +-8.12e-007				
	131.20	8.69e-006 +-4.75e-007				
Ac-227	115.35	4.53e-004 +-9.87e-005	1.91e+005	1	of	1
Ra-226	186.10	I.D.Only	1.40e+007	1	of	1
Ac-228	Average:	8.68e-005 +-4.21e-007	6.13e+000	10	of	10
	209.28	7.69e-005 +-2.19e-006				
	270.23	3.80e-005 +-2.44e-006				
	327.64	7.21e-005 +-2.90e-006				
	338.32	8.27e-005 +-9.98e-007				
	409.51	6.59e-005 +-3.76e-006				
	463.00	7.96e-005 +-2.09e-006				
	794.70	7.74e-005 +-2.23e-006				
	911.07	9.18e-005 +-6.77e-007				
	964.60	8.80e-005 +-1.84e-006				
	969.11	9.51e-005 +-9.26e-007				
Ra-224	240.98	1.14e-004 +-1.60e-006	8.69e+001	1	of	1
Bi-212	727.17	5.25e-005 +-1.02e-006	1.01e+000	1	of	2
Pb-211	831.96	1.68e-005 +-3.30e-006	6.02e-001	1	of	3
Bi-214	Average:	1.44e-005 +-2.08e-007	3.32e-001	7	of	7
	609.31	1.41e-005 +-2.37e-007				
	768.36	1.12e-005 +-1.64e-006				
	934.06	1.28e-005 +-2.53e-006				
	1120.30	1.49e-005 +-6.58e-007				
	1238.10	1.92e-005 +-1.55e-006				
	1377.70	1.60e-005 +-2.45e-006				
	1764.50	1.64e-005 +-7.39e-007				
K-40	1460.80	2.04e-005 +-1.05e-006	1.12e+013	1	of	1
TOTAL:		9.79e-004 uCi/g				

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
106.05	441.47	3541	376	791	22715	1.63	2.601e+001
562.34	2313.01	1098	137	278	3556	1.34	1.446e+001
754.88	3103.09	612	148	316	2835	1.65	1.045e+001
762.79	3135.54	387	145	308	3239	1.63	6.669e+000
771.97	3173.19	1370	115	233	1889	2.09	2.386e+001
785.15	3227.28	920	98	193	1957	1.89	1.627e+001
835.26	3432.89	1656	86	157	1246	2.09	3.093e+001
839.65	3450.91	926	93	189	1250	1.92	1.738e+001
903.61	3713.36	494	103	217	1494	1.69	9.897e+000
1077.89	4428.43	406	64	129	702	1.60	9.519e+000
1093.45	4492.25	559	66	129	702	2.10	1.327e+001
1109.57	4558.40	384	65	130	693	1.99	9.239e+000
1245.64	5116.52	560	84	175	805	3.25	1.494e+001
1494.57	6137.18	541	56	108	415	2.24	1.699e+001

1500.25	6160.46	285	56	114	443	2.14	8.978e+000
1579.10	6483.57	288	68	144	554	2.03	9.498e+000
1586.82	6515.22	2001	66	103	459	2.16	6.628e+001
1591.08	6532.69	1028	61	112	422	2.38	3.413e+001
1619.24	6648.04	795	65	124	630	2.25	2.681e+001
1629.30	6689.27	995	62	116	411	2.15	3.375e+001
1636.83	6720.13	260	56	117	415	1.98	8.855e+000
1728.40	7095.17	403	48	94	334	2.14	1.441e+001

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012830 STS LAKE SHORE EAST B5 1'

Sample Size . . . . 4.37e+002 g	Spectrum File . . H:\PCASPEC\012830.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-14-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 %	Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50	

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.73e-007 +-3.68e-008	6.17e+012	1 of 7
Pb-212	238.63	1.13e-006 +-5.96e-008	1.06e+001	1 of 5
Pb-214	Average:	1.32e-006 +-5.21e-008	4.47e-001	3 of 6
	241.98	1.36e-006 +-1.93e-007		
	295.21	1.36e-006 +-1.04e-007		
	351.92	1.30e-006 +-6.34e-008		
Tl-208	Average:	4.02e-007 +-2.77e-008	5.09e-002	2 of 5
	510.84	6.18e-007 +-1.12e-007		
	583.14	3.88e-007 +-2.86e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	1.16e-006 +-8.18e-008	6.13e+000	3 of 10
	338.32	1.18e-006 +-1.77e-007		
	911.07	1.19e-006 +-1.04e-007		
	969.11	1.02e-006 +-1.98e-007		
Bi-214	Average:	1.21e-006 +-5.90e-008	3.32e-001	3 of 7
	609.31	1.13e-006 +-6.52e-008		
	1120.30	1.49e-006 +-1.97e-007		
	1764.50	1.68e-006 +-1.96e-007		
K-40	1460.80	7.02e-006 +-4.96e-007	1.12e+013	1 of 1
TOTAL:		1.24e-005 uCi/g		

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012831 STS LAKE SHORE EAST B5 6'-7'

Sample Size . . . . 4.63e+002 g | Spectrum File . . H:\PCASPEC\012831.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. 08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	2.33e-007	+-3.90e-008	6.17e+012	1 of 7
Pb-212	Average:	1.10e-006	+-5.22e-008	1.06e+001	3 of 5
	74.82	1.10e-006	+-3.61e-007		
	77.11	1.10e-006	+-2.23e-007		
	238.63	1.10e-006	+-5.43e-008		
Pb-214	Average:	1.52e-006	+-5.46e-008	4.47e-001	5 of 6
	74.82	9.07e-007	+-6.21e-007		
	77.11	1.55e-006	+-3.84e-007		
	241.98	1.55e-006	+-2.24e-007		
	295.21	1.55e-006	+-1.08e-007		
	351.92	1.51e-006	+-6.72e-008		
Tl-208	Average:	2.99e-007	+-3.14e-008	5.09e-002	2 of 5
	510.84	5.01e-007	+-1.06e-007		
	583.14	2.80e-007	+-3.29e-008		
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	9.49e-007	+-8.08e-008	6.13e+000	3 of 10
	338.32	1.21e-006	+-1.64e-007		
	911.07	8.25e-007	+-1.11e-007		
	969.11	9.58e-007	+-1.69e-007		
Bi-214	Average:	1.44e-006	+-6.10e-008	3.32e-001	3 of 7
	609.31	1.41e-006	+-6.66e-008		
	1120.30	1.46e-006	+-2.38e-007		
	1764.50	1.68e-006	+-1.96e-007		
K-40	1460.80	9.08e-006	+-4.84e-007	1.12e+013	1 of 1

TOTAL: 1.46e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012832 STS LAKE SHORE EAST B6 1'

Sample Size . . . . 6.84e+002 g	Spectrum File . . H:\PCASPEC\012832.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-14-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	1.10e-007	+-2.75e-008	6.17e+012	1 of 7
Pb-212	238.63	6.62e-007	+-3.45e-008	1.06e+001	1 of 5
Pb-214	Average:	8.56e-007	+-3.50e-008	4.47e-001	3 of 6
	241.98	1.42e-006	+-1.64e-007		
	295.21	8.67e-007	+-7.00e-008		
	351.92	8.16e-007	+-4.17e-008		
Tl-208	Average:	1.91e-007	+-1.83e-008	5.09e-002	2 of 5
	510.84	2.18e-007	+-7.41e-008		
	583.14	1.89e-007	+-1.89e-008		
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	6.75e-007	+-5.45e-008	6.13e+000	3 of 10
	338.32	7.62e-007	+-1.11e-007		
	911.07	5.84e-007	+-7.66e-008		
	969.11	7.75e-007	+-1.09e-007		
Ra-224	240.98	2.69e-006	+-3.11e-007	8.69e+001	1 of 1
Tl-210	298.00	2.11e-007	+-1.70e-008	2.17e-002	1 of 3
Bi-211	351.07	2.35e-006	+-1.20e-007	3.55e-002	1 of 1
Bi-214	Average:	8.16e-007	+-3.93e-008	3.32e-001	3 of 7
	609.31	7.75e-007	+-4.46e-008		
	1120.30	9.49e-007	+-1.41e-007		
	1764.50	9.62e-007	+-1.03e-007		
K-40	1460.80	1.14e-005	+-4.41e-007	1.12e+013	1 of 1
TOTAL:		2.00e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

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==============================================================================
              RSSI High Resolution Gamma Spectroscopy Analysis
==============================================================================
                            Quantum Technology
                       GDR_C Nuclide Activity Summary
==============================================================================

Sample ID: 012833 STS LAKE SHORE EAST B6 9'

------------------------------------------------------------------------------
Sample Size . . . . . . . 1.01e+003 g | Spectrum File . . H:\PCASPEC\012833.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]      02-01-01 12:00
------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .  8.000 Halflives
Library Energy Tolerance. . .   2.50
------------------------------------------------------------------------------
------------------------------------------------------------------------------

                         FINAL ACTIVITY REPORT

              Energy      Conc +- 1.00sigma    Halflife       Peaks
Nuclide        (keV)      (uCi/g           )      (hrs)        Found
==============================================================================
Ra-223          94.90    8.81e-007 +-1.59e-007 2.74e+002    1 of    7
U-235         Average:   1.57e-007 +-2.30e-008 6.17e+012    2 of    7
                93.35    2.21e-006 +-3.99e-007
               185.72    1.50e-007 +-2.31e-008
Th-234        Average:   3.65e-006 +-4.64e-007 5.78e+002    2 of    3
                92.38    3.62e-006 +-6.52e-007
                92.80    3.67e-006 +-6.61e-007
Pb-212        Average:   6.64e-007 +-2.99e-008 1.06e+001    3 of    5
                74.82    6.65e-007 +-1.81e-007
                77.11    6.64e-007 +-1.23e-007
               238.63    6.64e-007 +-3.13e-008
Pb-214        Average:   1.11e-006 +-3.05e-008 4.47e-001    5 of    6
                74.82    1.16e-006 +-3.12e-007
                77.11    1.05e-006 +-2.12e-007
               241.98    1.26e-006 +-1.28e-007
               295.21    1.11e-006 +-6.20e-008
               351.92    1.10e-006 +-3.73e-008
Tl-208        Average:   1.66e-007 +-1.63e-008 5.09e-002    3 of    5
                74.97    1.61e-007 +-5.64e-007
               510.84    1.99e-007 +-6.01e-008
               583.14    1.63e-007 +-1.69e-008
Pa-234          94.66    6.29e-007 +-1.13e-007 6.70e+000    1 of   14
Ra-226         186.10              I.D.Only    1.40e+007    1 of    1
Ac-228        Average:   6.76e-007 +-4.33e-008 6.13e+000    3 of   10
               338.32    6.00e-007 +-8.71e-008
               911.07    6.74e-007 +-5.85e-008
               969.11    7.73e-007 +-9.60e-008
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Ra-224	240.98	2.40e-006	+-2.44e-007	8.69e+001	1 of 1
Tl-210	298.00	2.70e-007	+-1.51e-008	2.17e-002	1 of 3
Bi-212	727.17	4.57e-007	+-1.01e-007	1.01e+000	1 of 2
Bi-211	351.07	3.16e-006	+-1.07e-007	3.55e-002	1 of 1
Bi-214	Average:	1.04e-006	+-3.43e-008	3.32e-001	3 of 7
	609.31	1.02e-006	+-3.74e-008		
	1120.30	9.44e-007	+-1.34e-007		
	1764.50	1.25e-006	+-1.11e-007		
K-40	1460.80	1.77e-005	+-4.13e-007	1.12e+013	1 of 1

TOTAL: 3.30e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012834 STS LAKE SHORE EAST B7 1'

Sample Size . . . . 5.52e+002 g | Spectrum File . . H:\PCASPEC\012834.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. 08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
Pb-212	238.63	5.26e-007	+-3.94e-008	1.06e+001	1 of 5
Pb-214	Average:	6.89e-007	+-3.91e-008	4.47e-001	3 of 6
	241.98	7.91e-007	+-1.68e-007		
	295.21	7.89e-007	+-7.58e-008		
	351.92	6.42e-007	+-4.74e-008		
Tl-208	583.14	1.45e-007	+-2.18e-008	5.09e-002	1 of 5
Ac-228	Average:	5.56e-007	+-6.20e-008	6.13e+000	2 of 10
	338.32	7.47e-007	+-1.37e-007		
	911.07	5.06e-007	+-6.96e-008		
Bi-214	Average:	6.86e-007	+-4.20e-008	3.32e-001	3 of 7
	609.31	6.49e-007	+-4.57e-008		
	1120.30	8.78e-007	+-1.54e-007		
	1764.50	9.11e-007	+-1.50e-007		
K-40	1460.80	9.89e-006	+-4.69e-007	1.12e+013	1 of 1
TOTAL:		1.25e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012835 STS LAKE SHORE EAST B7 3'

Sample Size . . . . 8.47e+002 g	Spectrum File . . H:\PCASPEC\012835.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-14-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
Pb-212	238.63	2.62e-007	+-2.84e-008	1.06e+001	1 of 5
Pb-214	Average:	3.63e-007	+-2.69e-008	4.47e-001	2 of 6
	295.21	3.63e-007	+-5.52e-008		
	351.92	3.63e-007	+-3.09e-008		
Tl-208	583.14	9.99e-008	+-1.42e-008	5.09e-002	1 of 5
Ac-228	Average:	3.15e-007	+-4.52e-008	6.13e+000	2 of 10
	338.32	3.13e-007	+-8.47e-008		
	911.07	3.16e-007	+-5.34e-008		
Ra-224	240.98	2.97e-006	+-3.20e-007	8.69e+001	1 of 1
Bi-211	351.07	2.05e-007	+-8.88e-008	3.55e-002	1 of 1
Bi-214	609.31	4.42e-007	+-2.98e-008	3.32e-001	1 of 7
K-40	1460.80	1.18e-005	+-3.76e-007	1.12e+013	1 of 1

TOTAL: 1.64e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012836 STS LAKE SHORE EAST B3A 6'

```
Sample Size . . . . . . . 6.58e+002 g | Spectrum File . . H:\PCASPEC\012836.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
-------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
-------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]      02-01-01 12:00
-------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
```

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	94.90	7.10e-007 +-2.29e-007	2.74e+002	1 of 7
U-235	Average:	9.42e-008 +-2.78e-008	6.17e+012	2 of 7
	93.35	1.78e-006 +-5.76e-007		
	185.72	9.02e-008 +-2.79e-008		
Th-234	Average:	2.94e-006 +-6.71e-007	5.78e+002	2 of 3
	92.38	2.92e-006 +-9.42e-007		
	92.80	2.96e-006 +-9.55e-007		
Pb-212	Average:	9.02e-007 +-4.04e-008	1.06e+001	3 of 5
	74.82	9.02e-007 +-2.82e-007		
	77.11	9.03e-007 +-1.69e-007		
	238.63	9.02e-007 +-4.21e-008		
Pb-214	Average:	1.09e-006 +-3.81e-008	4.47e-001	5 of 6
	74.82	1.09e-006 +-4.86e-007		
	77.11	1.09e-006 +-2.91e-007		
	241.98	1.09e-006 +-1.58e-007		
	295.21	1.09e-006 +-7.97e-008		
	351.92	1.09e-006 +-4.59e-008		
Tl-208	Average:	3.12e-007 +-2.21e-008	5.09e-002	3 of 5
	74.97	3.04e-007 +-8.80e-007		
	510.84	3.51e-007 +-8.09e-008		
	583.14	3.09e-007 +-2.30e-008		
Pa-234	94.66	5.07e-007 +-1.64e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	9.42e-007 +-6.19e-008	6.13e+000	3 of 10
	338.32	9.53e-007 +-1.24e-007		
	911.07	9.27e-007 +-8.53e-008		
	969.11	9.64e-007 +-1.31e-007		

Ra-224	240.98	1.10e-006 +-3.00e-007	8.69e+001	1 of	1
Bi-214	Average:	1.12e-006 +-4.56e-008	3.32e-001	3 of	7
	609.31	1.07e-006 +-5.06e-008			
	1120.30	1.18e-006 +-1.53e-007			
	1764.50	1.48e-006 +-1.44e-007			
K-40	1460.80	1.12e-005 +-4.36e-007	1.12e+013	1 of	1

TOTAL: 2.09e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012837 STS LAKE SHORE EAST B3A 3.5'-4.5'

Sample Size . . . . 6.61e+002 g | Spectrum File . . H:\PCASPEC\012837.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. 08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	94.90	1.11e-006 +-2.27e-007	2.74e+002	1 of 7
U-235	Average:	2.19e-007 +-3.02e-008	6.17e+012	2 of 7
	93.35	2.78e-006 +-5.71e-007		
	185.72	2.12e-007 +-3.03e-008		
Th-234	Average:	4.58e-006 +-6.65e-007	5.78e+002	2 of 3
	92.38	4.55e-006 +-9.34e-007		
	92.80	4.61e-006 +-9.47e-007		
Pb-212	Average:	9.09e-007 +-4.11e-008	1.06e+001	3 of 5
	74.82	9.09e-007 +-2.71e-007		
	77.11	9.09e-007 +-1.78e-007		
	238.63	9.09e-007 +-4.28e-008		
Pb-214	Average:	1.46e-006 +-4.15e-008	4.47e-001	5 of 6
	74.82	1.46e-006 +-4.66e-007		
	77.11	1.46e-006 +-3.07e-007		
	241.98	1.46e-006 +-1.68e-007		
	295.21	1.46e-006 +-8.31e-008		
	351.92	1.46e-006 +-5.09e-008		
Tl-208	Average:	3.03e-007 +-2.33e-008	5.09e-002	3 of 5
	74.97	3.04e-007 +-8.43e-007		
	510.84	2.69e-007 +-7.87e-008		
	583.14	3.07e-007 +-2.44e-008		
Pa-234	94.66	7.90e-007 +-1.62e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	1.07e-006 +-6.35e-008	6.13e+000	3 of 10
	338.32	1.08e-006 +-1.30e-007		
	911.07	1.02e-006 +-8.87e-008		
	969.11	1.16e-006 +-1.27e-007		

Ra-224	240.98	6.72e-007 +-3.19e-007	8.69e+001	1 of	1
Bi-214	Average:	1.36e-006 +-4.68e-008	3.32e-001	3 of	7
	609.31	1.26e-006 +-5.11e-008			
	1120.30	1.82e-006 +-1.59e-007			
	1764.50	1.94e-006 +-1.72e-007			
K-40	1460.80	1.19e-005 +-4.60e-007	1.12e+013	1 of	1

TOTAL: 2.44e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012838 STS LAKE SHORE EAST B4A 1'-2'

Sample Size . . . . 7.20e+002 g	Spectrum File . . H:\PCASPEC\012838.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-14-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	7.77e-008	+-1.99e-008	6.17e+012	1 of 7
Pb-212	238.63	2.76e-007	+-3.53e-008	1.06e+001	1 of 5
Pb-214	Average:	4.24e-007	+-2.86e-008	4.47e-001	2 of 6
	295.21	4.13e-007	+-5.82e-008		
	351.92	4.27e-007	+-3.29e-008		
Tl-208	583.14	1.28e-007	+-1.62e-008	5.09e-002	1 of 5
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	911.07	4.35e-007	+-5.84e-008	6.13e+000	1 of 10
Ra-224	240.98	3.13e-006	+-3.99e-007	8.69e+001	1 of 1
Tl-210	298.00	1.01e-007	+-1.42e-008	2.17e-002	1 of 3
Bi-211	351.07	1.23e-006	+-9.45e-008	3.55e-002	1 of 1
Bi-214	609.31	3.72e-007	+-3.41e-008	3.32e-001	1 of 7
K-40	1460.80	1.10e-005	+-4.06e-007	1.12e+013	1 of 1

TOTAL: 1.71e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012839 STS LAKE SHORE EAST B4A 6'

Sample Size . . . . 8.77e+002 g	Spectrum File . . H:\PCASPEC\012839.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-14-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	7.29e-008 +-2.07e-008	6.17e+012	1 of 7
Pb-212	Average:	5.05e-007 +-2.80e-008	1.06e+001	3 of 5
	74.82	5.06e-007 +-1.79e-007		
	77.11	5.05e-007 +-1.23e-007		
	238.63	5.05e-007 +-2.91e-008		
Pb-214	Average:	7.35e-007 +-2.89e-008	4.47e-001	4 of 6
	77.11	6.32e-007 +-2.12e-007		
	241.98	8.35e-007 +-1.33e-007		
	295.21	6.68e-007 +-6.06e-008		
	351.92	7.53e-007 +-3.43e-008		
Tl-208	Average:	1.88e-007 +-1.66e-008	5.09e-002	2 of 5
	74.97	1.84e-007 +-5.59e-007		
	583.14	1.88e-007 +-1.66e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	4.40e-007 +-4.78e-008	6.13e+000	3 of 10
	338.32	3.52e-007 +-9.79e-008		
	911.07	4.89e-007 +-6.43e-008		
	969.11	4.11e-007 +-1.04e-007		
Ra-224	240.98	1.58e-006 +-2.52e-007	8.69e+001	1 of 1
Tl-210	298.00	1.62e-007 +-1.47e-008	2.17e-002	1 of 3
Bi-211	351.07	2.17e-006 +-9.87e-008	3.55e-002	1 of 1
Bi-214	Average:	6.60e-007 +-3.17e-008	3.32e-001	3 of 7
	609.31	6.29e-007 +-3.50e-008		
	1120.30	7.60e-007 +-1.17e-007		
	1764.50	8.29e-007 +-9.81e-008		
K-40	1460.80	1.03e-005 +-3.58e-007	1.12e+013	1 of 1

TOTAL: 1.68e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un- Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012840 STS LAKE SHORE EAST B4B 3'

Sample Size . . . . 5.98e+002 g | Spectrum File . . H:\PCASPEC\012840.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. 08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	7.74e-008	+-2.86e-008	6.17e+012	1 of 7
Pb-212	238.63	6.91e-007	+-4.04e-008	1.06e+001	1 of 5
Pb-214	Average:	8.64e-007	+-4.11e-008	4.47e-001	3 of 6
	241.98	1.03e-006	+-1.75e-007		
	295.21	8.27e-007	+-8.99e-008		
	351.92	8.62e-007	+-4.79e-008		
Tl-208	Average:	2.22e-007	+-2.07e-008	5.09e-002	2 of 5
	510.84	2.26e-007	+-8.25e-008		
	583.14	2.22e-007	+-2.14e-008		
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	6.84e-007	+-6.15e-008	6.13e+000	3 of 10
	338.32	6.62e-007	+-1.37e-007		
	911.07	7.34e-007	+-7.97e-008		
	969.11	5.62e-007	+-1.36e-007		
Ra-224	240.98	1.96e-006	+-3.32e-007	8.69e+001	1 of 1
Tl-210	298.00	2.01e-007	+-2.18e-008	2.17e-002	1 of 3
Bi-211	351.07	2.48e-006	+-1.38e-007	3.55e-002	1 of 1
Bi-214	Average:	8.08e-007	+-4.32e-008	3.32e-001	3 of 7
	609.31	7.92e-007	+-4.63e-008		
	1120.30	8.75e-007	+-1.74e-007		
	1764.50	9.56e-007	+-1.66e-007		
K-40	1460.80	1.32e-005	+-4.59e-007	1.12e+013	1 of 1
TOTAL:		2.12e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

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================================================================================
          RSSI High Resolution Gamma Spectroscopy Analysis
================================================================================
                          Quantum Technology
                    GDR_C Nuclide Activity Summary
================================================================================

Sample ID: 012841 STS LAKE SHORE EAST B4B 5'-6'

--------------------------------------------------------------------------------
Sample Size . . . . . . . 6.62e+002 g | Spectrum File . . H:\PCASPEC\012841.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
--------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
--------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]       02-01-01 12:00
--------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------

                         FINAL ACTIVITY REPORT

              Energy       Conc +- 1.00sigma    Halflife        Peaks
Nuclide        (keV)       (uCi/g           )      (hrs)        Found
================================================================================
U-235         185.72     1.13e-007 +-2.61e-008 6.17e+012     1 of    7
Pb-212        238.63     6.89e-007 +-3.89e-008 1.06e+001     1 of    5
Pb-214      Average:     7.91e-007 +-3.85e-008 4.47e-001     3 of    6
              241.98     7.89e-007 +-1.66e-007
              295.21     7.91e-007 +-7.26e-008
              351.92     7.91e-007 +-4.73e-008
Tl-208      Average:     1.93e-007 +-2.06e-008 5.09e-002     2 of    5
              510.84     2.41e-007 +-7.82e-008
              583.14     1.90e-007 +-2.14e-008
Ra-226        186.10                I.D.Only  1.40e+007      1 of    1
Ac-228      Average:     5.73e-007 +-5.70e-008 6.13e+000     3 of   10
              338.32     6.01e-007 +-1.23e-007
              911.07     5.89e-007 +-7.68e-008
              969.11     5.08e-007 +-1.18e-007
Ra-224        240.98     9.58e-007 +-3.14e-007 8.69e+001     1 of    1
Bi-214      Average:     7.58e-007 +-4.15e-008 3.32e-001     3 of    7
              609.31     7.38e-007 +-4.54e-008
             1120.30     9.61e-007 +-1.42e-007
             1764.50     7.60e-007 +-1.48e-007
K-40         1460.80     1.25e-005 +-4.53e-007 1.12e+013     1 of    1

TOTAL:                   1.66e-005 uCi/g
--------------------------------------------------------------------------------

                              UNKNOWN PEAKS

Energy  Centroid     Net     Un-       C.L.      Bkg.   FWHM       Net
```

(keV)	Channel	Counts	Certainty	Counts	Counts	(keV)	Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012842 STS LAKE SHORE EAST B4/8 1'-2'

Sample Size . . . . 6.26e+002 g	Spectrum File . . H:\PCASPEC\012842.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-14-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.25e-007 +-2.54e-008	6.17e+012	1 of 7
Pb-212	238.63	3.79e-007 +-3.76e-008	1.06e+001	1 of 5
Pb-214	Average:	7.29e-007 +-3.84e-008	4.47e-001	2 of 6
	295.21	6.95e-007 +-8.00e-008		
	351.92	7.40e-007 +-4.38e-008		
Tl-208	583.14	1.39e-007 +-1.86e-008	5.09e-002	1 of 5
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	911.07	3.77e-007 +-6.98e-008	6.13e+000	1 of 10
Ra-224	240.98	4.28e-006 +-4.25e-007	8.69e+001	1 of 1
Tl-210	298.00	1.69e-007 +-1.94e-008	2.17e-002	1 of 3
Bi-211	351.07	2.13e-006 +-1.26e-007	3.55e-002	1 of 1
Bi-214	Average:	6.41e-007 +-3.88e-008	3.32e-001	2 of 7
	609.31	6.01e-007 +-4.10e-008		
	1764.50	9.83e-007 +-1.20e-007		
K-40	1460.80	1.25e-005 +-4.61e-007	1.12e+013	1 of 1
TOTAL:		2.15e-005 uCi/g		

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012843 STS LAKE SHORE EAST B4/8 6'

Sample Size . . . . 4.42e+002 g | Spectrum File . . H:\PCASPEC\012843.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. 08-14-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.78e-007 +-4.18e-008	6.17e+012	1 of 7
Pb-212	238.63	6.09e-007 +-5.13e-008	1.06e+001	1 of 5
Pb-214	Average:	1.31e-006 +-5.16e-008	4.47e-001	3 of 6
	241.98	1.35e-006 +-2.08e-007		
	295.21	1.33e-006 +-1.07e-007		
	351.92	1.31e-006 +-6.14e-008		
Tl-208	583.14	1.75e-007 +-2.49e-008	5.09e-002	1 of 5
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	911.07	4.81e-007 +-8.67e-008	6.13e+000	1 of 10
Ra-224	240.98	2.57e-006 +-3.95e-007	8.69e+001	1 of 1
Tl-210	298.00	3.23e-007 +-2.59e-008	2.17e-002	1 of 3
Bi-211	351.07	3.75e-006 +-1.77e-007	3.55e-002	1 of 1
Bi-214	Average:	1.13e-006 +-5.62e-008	3.32e-001	3 of 7
	609.31	1.11e-006 +-6.17e-008		
	1120.30	1.04e-006 +-2.01e-007		
	1764.50	1.45e-006 +-1.84e-007		
K-40	1460.80	9.74e-006 +-5.25e-007	1.12e+013	1 of 1
TOTAL:		2.03e-005 uCi/g		

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012861 STS LAKE SHORE EAST B5A 1'

Sample Size . . . . 6.60e+002 g	Spectrum File . . H:\PCASPEC\012861.SPM
Sampling Start. 00-00-00 00:00	Counting Start. . . . 08-15-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	94.90	1.01e-006 +-2.23e-007	2.74e+002	1 of 7
U-235	Average:	1.43e-007 +-2.93e-008	6.17e+012	2 of 7
	93.35	2.53e-006 +-5.61e-007		
	185.72	1.37e-007 +-2.94e-008		
Th-234	Average:	4.17e-006 +-6.54e-007	5.78e+002	2 of 3
	92.38	4.14e-006 +-9.18e-007		
	92.80	4.19e-006 +-9.31e-007		
Pb-212	Average:	1.20e-006 +-4.17e-008	1.06e+001	3 of 5
	74.82	1.20e-006 +-2.66e-007		
	77.11	1.20e-006 +-1.64e-007		
	238.63	1.20e-006 +-4.37e-008		
Pb-214	Average:	1.01e-006 +-3.91e-008	4.47e-001	5 of 6
	74.82	1.56e-006 +-4.59e-007		
	77.11	9.96e-007 +-2.82e-007		
	241.98	1.85e-006 +-1.70e-007		
	295.21	1.07e-006 +-8.34e-008		
	351.92	9.24e-007 +-4.67e-008		
Tl-208	Average:	3.58e-007 +-2.24e-008	5.09e-002	3 of 5
	74.97	3.59e-007 +-8.30e-007		
	510.84	4.19e-007 +-7.80e-008		
	583.14	3.53e-007 +-2.34e-008		
Pa-234	94.66	7.18e-007 +-1.59e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	1.11e-006 +-6.36e-008	6.13e+000	3 of 10
	338.32	1.09e-006 +-1.37e-007		
	911.07	1.18e-006 +-8.14e-008		
	969.11	8.93e-007 +-1.54e-007		

Ra-224	240.98	3.51e-006 +-3.23e-007	8.69e+001	1 of	1
Tl-210	298.00	2.59e-007 +-2.03e-008	2.17e-002	1 of	3
Bi-211	351.07	2.66e-006 +-1.34e-007	3.55e-002	1 of	1
Bi-214	Average:	9.73e-007 +-4.25e-008	3.32e-001	3 of	7
	609.31	9.22e-007 +-4.69e-008			
	1120.30	9.84e-007 +-1.59e-007			
	1764.50	1.36e-006 +-1.31e-007			
K-40	1460.80	1.07e-005 +-4.57e-007	1.12e+013	1 of	1
TOTAL:		2.78e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012862 STS LAKE SHORE EAST B5A 6'

Sample Size . . . . 8.22e+002 g	Spectrum File . . H:\PCASPEC\012862.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-15-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	1.07e-007	+-2.31e-008	6.17e+012	1 of 7
Pb-212	Average:	8.05e-007	+-3.39e-008	1.06e+001	3 of 5
	74.82	8.05e-007	+-2.09e-007		
	77.11	8.04e-007	+-1.35e-007		
	238.63	8.05e-007	+-3.55e-008		
Pb-214	Average:	1.07e-006	+-3.34e-008	4.47e-001	4 of 6
	77.11	7.44e-007	+-2.33e-007		
	241.98	1.62e-006	+-1.48e-007		
	295.21	1.04e-006	+-6.63e-008		
	351.92	1.04e-006	+-4.07e-008		
Tl-208	Average:	2.65e-007	+-1.90e-008	5.09e-002	3 of 5
	74.97	2.65e-007	+-6.50e-007		
	510.84	2.96e-007	+-7.49e-008		
	583.14	2.63e-007	+-1.97e-008		
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	8.04e-007	+-4.86e-008	6.13e+000	3 of 10
	338.32	9.67e-007	+-9.83e-008		
	911.07	7.90e-007	+-6.52e-008		
	969.11	6.41e-007	+-1.09e-007		
Ra-224	240.98	3.07e-006	+-2.80e-007	8.69e+001	1 of 1
Tl-210	298.00	2.53e-007	+-1.61e-008	2.17e-002	1 of 3
Bi-211	351.07	3.00e-006	+-1.17e-007	3.55e-002	1 of 1
Bi-214	Average:	9.24e-007	+-3.83e-008	3.32e-001	3 of 7
	609.31	9.05e-007	+-4.17e-008		
	1120.30	9.16e-007	+-1.33e-007		
	1764.50	1.15e-006	+-1.42e-007		
K-40	1460.80	8.49e-006	+-3.47e-007	1.12e+013	1 of 1

TOTAL: 1.88e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012863 STS LAKE SHORE EAST B8A 3'-4'

Sample Size . . . . 6.05e+002 g	Spectrum File . . H:\PCASPEC\012863.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-15-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 %	Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50	

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	94.90	1.81e-006 +-3.51e-007	2.74e+002	1 of 7
U-235	Average:	3.13e-007 +-5.08e-008	6.17e+012	2 of 7
	93.35	4.54e-006 +-8.81e-007		
	185.72	2.99e-007 +-5.09e-008		
Th-234	Average:	7.48e-006 +-1.03e-006	5.78e+002	2 of 3
	92.38	7.43e-006 +-1.44e-006		
	92.80	7.53e-006 +-1.46e-006		
Pb-212	Average:	7.02e-006 +-9.16e-008	1.06e+001	5 of 5
	74.82	7.16e-006 +-5.47e-007		
	77.11	6.92e-006 +-3.15e-007		
	87.30	3.45e-006 +-5.62e-007		
	238.63	7.16e-006 +-9.95e-008		
	300.09	5.43e-006 +-7.72e-007		
Pb-214	Average:	2.09e-006 +-6.71e-008	4.47e-001	5 of 6
	74.82	2.08e-006 +-9.41e-007		
	77.11	2.09e-006 +-5.42e-007		
	241.98	2.09e-006 +-2.68e-007		
	295.21	2.09e-006 +-1.45e-007		
	351.92	2.09e-006 +-8.00e-008		
Tl-208	Average:	2.46e-006 +-4.81e-008	5.09e-002	5 of 5
	74.97	2.39e-006 +-1.70e-006		
	277.35	2.74e-006 +-3.77e-007		
	510.84	2.84e-006 +-1.51e-007		
	583.14	2.38e-006 +-5.24e-008		
	860.37	2.99e-006 +-2.43e-007		
Pa-234	Average:	8.18e-007 +-1.30e-007	6.70e+000	2 of 14
	94.66	8.16e-007 +-2.50e-007		

	131.20	8.18e-007 +-1.52e-007					
Ra-226	186.10	I.D.Only	1.40e+007	1	of	1
Ac-228	Average:	7.28e-006 +-1.16e-007	6.13e+000	10	of	10
	209.28	6.65e-006 +-6.30e-007				
	270.23	6.36e-006 +-6.73e-007				
	327.64	7.37e-006 +-7.21e-007				
	338.32	7.24e-006 +-2.52e-007				
	409.51	6.51e-006 +-1.24e-006				
	463.00	7.22e-006 +-6.43e-007				
	794.70	7.82e-006 +-6.61e-007				
	911.07	7.38e-006 +-1.83e-007				
	964.60	7.21e-006 +-6.11e-007				
	969.11	7.34e-006 +-2.67e-007				
Ra-224	240.98	9.86e-006 +-5.09e-007	8.69e+001	1	of	1
Bi-212	Average:	5.17e-006 +-2.98e-007	1.01e+000	2	of	2
	327.96	5.20e-006 +-1.79e-005				
	727.17	5.17e-006 +-2.98e-007				
Bi-211	351.07	8.62e-007 +-2.30e-007	3.55e-002	1	of	1
Bi-214	Average:	2.35e-006 +-6.91e-008	3.32e-001	4	of	7
	609.31	2.25e-006 +-7.66e-008				
	1120.30	2.47e-006 +-2.26e-007				
	1238.10	3.29e-006 +-5.82e-007				
	1764.50	3.05e-006 +-2.46e-007				
K-40	1460.80	1.51e-005 +-5.88e-007	1.12e+013	1	of	1

TOTAL: 6.26e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
1586.93	6515.65	119	27	52	121	1.46	3.942e+000

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012864 STS LAKE SHORE EAST B8A 6'

Sample Size . . . . 8.80e+002 g | Spectrum File . . H:\PCASPEC\012864.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. 08-15-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	94.90	1.30e-006 +-2.23e-007	2.74e+002	1 of 7
U-235	Average:	2.20e-007 +-2.86e-008	6.17e+012	2 of 7
	93.35	3.26e-006 +-5.60e-007		
	185.72	2.12e-007 +-2.86e-008		
Th-234	Average:	5.38e-006 +-6.52e-007	5.78e+002	2 of 3
	92.38	5.34e-006 +-9.16e-007		
	92.80	5.41e-006 +-9.29e-007		
Pb-212	Average:	1.99e-006 +-4.34e-008	1.06e+001	5 of 5
	74.82	2.04e-006 +-2.58e-007		
	77.11	1.77e-006 +-1.83e-007		
	87.30	1.05e-006 +-2.93e-007		
	238.63	2.03e-006 +-4.61e-008		
	300.09	1.63e-006 +-4.34e-007		
Pb-214	Average:	1.41e-006 +-3.96e-008	4.47e-001	5 of 6
	74.82	4.46e-007 +-4.44e-007		
	77.11	1.42e-006 +-3.15e-007		
	241.98	1.42e-006 +-1.67e-007		
	295.21	1.42e-006 +-8.03e-008		
	351.92	1.42e-006 +-4.82e-008		
Tl-208	Average:	7.57e-007 +-2.34e-008	5.09e-002	3 of 5
	510.84	8.06e-007 +-8.21e-008		
	583.14	7.45e-007 +-2.50e-008		
	860.37	9.27e-007 +-1.21e-007		
Pa-234	94.66	9.27e-007 +-1.59e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	2.09e-006 +-6.20e-008	6.13e+000	7 of 10
	209.28	2.24e-006 +-3.90e-007		

	270.23	1.93e-006 +-3.80e-007			
	338.32	1.95e-006 +-1.35e-007			
	463.00	2.04e-006 +-3.34e-007			
	794.70	2.12e-006 +-3.61e-007			
	911.07	2.06e-006 +-9.07e-008			
	969.11	2.28e-006 +-1.37e-007			
Ra-224	240.98	1.98e-006 +-3.16e-007	8.69e+001	1 of	1
Bi-212	727.17	1.54e-006 +-1.64e-007	1.01e+000	1 of	2
Bi-214	Average:	1.28e-006 +-4.31e-008	3.32e-001	3 of	7
	609.31	1.26e-006 +-4.66e-008			
	1120.30	1.26e-006 +-1.49e-007			
	1764.50	1.60e-006 +-1.70e-007			
K-40	1460.80	8.55e-006 +-3.28e-007	1.12e+013	1 of	1
TOTAL:		2.74e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012865 STS LAKE SHORE EAST B8B 1'

```
Sample Size . . . . . . . 9.04e+002 g | Spectrum File . . H:\PCASPEC\012865.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-15-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs

Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]       02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
```

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.48e-007 +-2.28e-008	6.17e+012	1 of 7
Pb-212	Average:	5.49e-007 +-2.87e-008	1.06e+001	3 of 5
	74.82	5.49e-007 +-1.88e-007		
	77.11	5.48e-007 +-1.26e-007		
	238.63	5.49e-007 +-2.99e-008		
Pb-214	Average:	8.68e-007 +-3.00e-008	4.47e-001	5 of 6
	74.82	8.63e-007 +-3.23e-007		
	77.11	6.27e-007 +-2.17e-007		
	241.98	1.13e-006 +-1.40e-007		
	295.21	8.80e-007 +-6.25e-008		
	351.92	8.54e-007 +-3.59e-008		
Tl-208	Average:	1.41e-007 +-1.68e-008	5.09e-002	2 of 5
	74.97	1.36e-007 +-5.85e-007		
	583.14	1.41e-007 +-1.68e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	5.00e-007 +-4.46e-008	6.13e+000	3 of 10
	338.32	5.67e-007 +-9.96e-008		
	911.07	4.81e-007 +-5.78e-008		
	969.11	4.91e-007 +-9.90e-008		
Ra-224	240.98	2.14e-006 +-2.65e-007	8.69e+001	1 of 1
Tl-210	298.00	2.14e-007 +-1.52e-008	2.17e-002	1 of 3
Bi-211	351.07	2.45e-006 +-1.03e-007	3.55e-002	1 of 1
Bi-214	Average:	8.33e-007 +-3.38e-008	3.32e-001	3 of 7
	609.31	8.17e-007 +-3.68e-008		
	1120.30	8.14e-007 +-1.25e-007		
	1764.50	1.00e-006 +-1.16e-007		
K-40	1460.80	1.75e-005 +-4.40e-007	1.12e+013	1 of 1

TOTAL: 2.54e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012866 STS LAKE SHORE EAST B8B 6'

Sample Size . . . . 8.28e+002 g	Spectrum File . . H:\PCASPEC\012866.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-15-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]   02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
U-235	185.72	1.27e-007 +-2.59e-008	6.17e+012	1 of 7
Pb-212	Average:	8.13e-007 +-3.42e-008	1.06e+001	3 of 5
	74.82	8.13e-007 +-2.43e-007		
	77.11	8.12e-007 +-1.42e-007		
	238.63	8.13e-007 +-3.56e-008		
Pb-214	Average:	1.04e-006 +-3.48e-008	4.47e-001	5 of 6
	74.82	1.30e-006 +-4.18e-007		
	77.11	9.17e-007 +-2.44e-007		
	241.98	1.60e-006 +-1.51e-007		
	295.21	1.03e-006 +-6.97e-008		
	351.92	1.01e-006 +-4.26e-008		
Tl-208	Average:	2.63e-007 +-1.79e-008	5.09e-002	3 of 5
	74.97	2.62e-007 +-7.56e-007		
	510.84	2.02e-007 +-6.96e-008		
	583.14	2.67e-007 +-1.86e-008		
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	8.90e-007 +-4.98e-008	6.13e+000	3 of 10
	338.32	1.04e-006 +-1.07e-007		
	911.07	8.77e-007 +-6.29e-008		
	969.11	7.24e-007 +-1.27e-007		
Ra-224	240.98	3.04e-006 +-2.86e-007	8.69e+001	1 of 1
Tl-210	298.00	2.50e-007 +-1.69e-008	2.17e-002	1 of 3
Bi-211	351.07	2.89e-006 +-1.22e-007	3.55e-002	1 of 1
Bi-214	Average:	1.00e-006 +-3.78e-008	3.32e-001	3 of 7
	609.31	9.60e-007 +-4.16e-008		
	1120.30	9.98e-007 +-1.48e-007		
	1764.50	1.33e-006 +-1.14e-007		

K-40	1460.80	1.01e-005 +-3.61e-007	1.12e+013	1 of	1

TOTAL: 2.04e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012867 STS LAKE SHORE EAST B8 3.5'-4'

Sample Size . . . . 7.06e+002 g	Spectrum File . . H:\PCASPEC\012867.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-15-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 %	Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50	

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	1.09e-007	+-2.49e-008	6.17e+012	1 of 7
Pb-212	238.63	5.33e-007	+-3.83e-008	1.06e+001	1 of 5
Pb-214	Average:	7.61e-007	+-3.62e-008	4.47e-001	2 of 6
	295.21	7.51e-007	+-7.12e-008		
	351.92	7.65e-007	+-4.21e-008		
Tl-208	583.14	2.29e-007	+-1.82e-008	5.09e-002	1 of 5
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	5.59e-007	+-5.23e-008	6.13e+000	3 of 10
	338.32	5.35e-007	+-1.15e-007		
	911.07	5.41e-007	+-7.29e-008		
	969.11	6.09e-007	+-9.95e-008		
Ra-224	240.98	6.03e-006	+-4.33e-007	8.69e+001	1 of 1
Tl-210	298.00	1.83e-007	+-1.73e-008	2.17e-002	1 of 3
Bi-211	351.07	2.20e-006	+-1.21e-007	3.55e-002	1 of 1
Bi-214	Average:	7.52e-007	+-3.79e-008	3.32e-001	3 of 7
	609.31	7.32e-007	+-4.13e-008		
	1120.30	7.05e-007	+-1.43e-007		
	1764.50	9.85e-007	+-1.29e-007		
K-40	1460.80	1.12e-005	+-4.22e-007	1.12e+013	1 of 1
TOTAL:		2.26e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

==

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012868 STS LAKE SHORE EAST B8 6'

```
Sample Size . . . . . . . 2.97e+002 g | Spectrum File . . H:\PCASPEC\012868.SPM
Sampling Start. . . . .00-00-00 00:00 | Counting Start. . . . .  08-15-01 00:00
Sampling Stop . . . . .00-00-00 00:00 | Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. . . . . .00-00-00 00:00 | Decay Time [OFF] . . . . . 0.00e+000 Hrs
-------------------------------------------------------------------------------
Efficiency File.H:\GDR\EFF\500MAR.EFF | Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . . . . . . .500 ml Marinelli | ID. . . .U, Th, & Ac Natural Series + K
-------------------------------------------------------------------------------
Eff.= 1/[ 7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001]       02-01-01 12:00
-------------------------------------------------------------------------------
Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . .   8.000 Halflives
Library Energy Tolerance. . .   2.50
```

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	94.90	3.46e-006 +-5.79e-007	2.74e+002	1 of 7
Th-234	Average:	1.43e-005 +-1.69e-006	5.78e+002	2 of 3
	92.38	1.42e-005 +-2.38e-006		
	92.80	1.44e-005 +-2.41e-006		
Pb-212	Average:	1.00e-005 +-1.50e-007	1.06e+001	5 of 5
	74.82	1.02e-005 +-8.06e-007		
	77.11	9.81e-006 +-5.04e-007		
	87.30	3.34e-006 +-1.01e-006		
	238.63	1.02e-005 +-1.64e-007		
	300.09	7.73e-006 +-1.29e-006		
Pb-214	Average:	2.20e-006 +-1.11e-007	4.47e-001	3 of 6
	241.98	8.00e-006 +-4.22e-007		
	295.21	1.64e-006 +-2.48e-007		
	351.92	1.80e-006 +-1.30e-007		
Tl-208	Average:	3.27e-006 +-8.00e-008	5.09e-002	5 of 5
	74.97	5.39e-007 +-2.51e-006		
	277.35	3.78e-006 +-8.55e-007		
	510.84	3.04e-006 +-2.58e-007		
	583.14	3.25e-006 +-8.65e-008		
	860.37	4.29e-006 +-4.07e-007		
Pa-234	94.66	2.47e-006 +-4.13e-007	6.70e+000	1 of 14
Ac-228	Average:	9.71e-006 +-1.93e-007	6.13e+000	10 of 10
	209.28	8.70e-006 +-1.15e-006		
	270.23	9.34e-006 +-1.30e-006		
	327.64	7.74e-006 +-1.25e-006		
	338.32	1.02e-005 +-4.25e-007		
	409.51	7.88e-006 +-1.86e-006		

	463.00	7.50e-006 +-1.00e-006			
	794.70	9.64e-006 +-1.10e-006			
	911.07	9.64e-006 +-3.06e-007			
	964.60	9.76e-006 +-1.07e-006			
	969.11	1.03e-005 +-4.27e-007			
Ra-224	240.98	1.52e-005 +-8.00e-007	8.69e+001	1 of	1
Tl-210	298.00	3.99e-007 +-6.02e-008	2.17e-002	1 of	3
Bi-212	727.17	6.91e-006 +-4.93e-007	1.01e+000	1 of	2
Bi-211	351.07	5.19e-006 +-3.74e-007	3.55e-002	1 of	1
Bi-214	Average:	1.67e-006 +-1.07e-007	3.32e-001	3 of	7
	609.31	1.61e-006 +-1.17e-007			
	1120.30	1.81e-006 +-3.57e-007			
	1764.50	2.18e-006 +-3.82e-007			
K-40	1460.80	1.43e-005 +-8.65e-007	1.12e+013	1 of	1
TOTAL:		8.91e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
1587.18	6516.71	124	21	38	61	2.21	4.108e+000

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012869 STS LAKE SHORE EAST B9 1'

Sample Size . . . . 5.29e+002 g	Spectrum File . . H:\PCASPEC\012869.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-15-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)		Halflife (hrs)	Peaks Found
U-235	185.72	1.89e-007	+-3.75e-008	6.17e+012	1 of 7
Pb-212	Average:	1.56e-006	+-5.52e-008	1.06e+001	3 of 5
	74.82	1.56e-006	+-2.77e-007		
	77.11	1.56e-006	+-2.19e-007		
	238.63	1.56e-006	+-5.83e-008		
Pb-214	Average:	1.41e-006	+-5.04e-008	4.47e-001	4 of 6
	77.11	1.64e-006	+-3.76e-007		
	241.98	2.04e-006	+-2.01e-007		
	295.21	1.50e-006	+-9.84e-008		
	351.92	1.31e-006	+-6.22e-008		
Tl-208	Average:	4.84e-007	+-2.74e-008	5.09e-002	3 of 5
	74.97	4.93e-007	+-8.62e-007		
	510.84	4.77e-007	+-1.00e-007		
	583.14	4.84e-007	+-2.85e-008		
Ra-226	186.10		I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	1.54e-006	+-8.06e-008	6.13e+000	3 of 10
	338.32	1.53e-006	+-1.70e-007		
	911.07	1.46e-006	+-1.11e-007		
	969.11	1.72e-006	+-1.63e-007		
Ra-224	240.98	3.86e-006	+-3.82e-007	8.69e+001	1 of 1
Tl-210	298.00	3.64e-007	+-2.39e-008	2.17e-002	1 of 3
Bi-212	727.17	9.28e-007	+-1.95e-007	1.01e+000	1 of 2
Bi-211	351.07	3.76e-006	+-1.79e-007	3.55e-002	1 of 1
Bi-214	Average:	1.32e-006	+-5.60e-008	3.32e-001	3 of 7
	609.31	1.32e-006	+-6.17e-008		
	1120.30	1.18e-006	+-2.04e-007		
	1764.50	1.44e-006	+-1.76e-007		

K-40	1460.80	9.45e-006 +-4.51e-007	1.12e+013	1 of 1

TOTAL: 2.49e-005 uCi/g

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec

None

RSSI High Resolution Gamma Spectroscopy Analysis

Quantum Technology
GDR_C Nuclide Activity Summary

Sample ID: 012870 STS LAKE SHORE EAST B9 7'

Sample Size . . . . 8.93e+002 g	Spectrum File . . H:\PCASPEC\012870.SPM
Sampling Start. 00-00-00 00:00	Counting Start. 08-15-01 00:00
Sampling Stop 00-00-00 00:00	Buildup Time. . . . . . . 0.00e+000 Hrs
Current Date. 00-00-00 00:00	Decay Time [OFF] . . . . . 0.00e+000 Hrs
Efficiency File.H:\GDR\EFF\500MAR.EFF	Library File. . . H:\GDR\LIB\UTHACK.LIB
ID. . . . . .500 ml Marinelli	ID. . . .U, Th, & Ac Natural Series + K

Eff.= 1/[7.31e-002*En^-2.40e+000 + 7.89e+001*En^8.95e-001] 02-01-01 12:00

Gamma Fraction Limit >= . . . 10.00 % | Decay Limit <=. . . . 8.000 Halflives
Library Energy Tolerance. . . 2.50

FINAL ACTIVITY REPORT

Nuclide	Energy (keV)	Conc +- 1.00sigma (uCi/g)	Halflife (hrs)	Peaks Found
Ra-223	94.90	8.48e-007 +-1.74e-007	2.74e+002	1 of 7
U-235	Average:	1.62e-007 +-2.66e-008	6.17e+012	2 of 7
	93.35	2.13e-006 +-4.37e-007		
	185.72	1.55e-007 +-2.67e-008		
Th-234	Average:	3.51e-006 +-5.09e-007	5.78e+002	2 of 3
	92.38	3.48e-006 +-7.16e-007		
	92.80	3.53e-006 +-7.25e-007		
Pb-212	Average:	9.06e-007 +-3.18e-008	1.06e+001	3 of 5
	74.82	9.06e-007 +-1.94e-007		
	77.11	9.06e-007 +-1.44e-007		
	238.63	9.06e-007 +-3.31e-008		
Pb-214	Average:	1.24e-006 +-3.45e-008	4.47e-001	4 of 6
	77.11	1.53e-006 +-2.48e-007		
	241.98	1.56e-006 +-1.74e-007		
	295.21	1.22e-006 +-6.90e-008		
	351.92	1.22e-006 +-4.15e-008		
Tl-208	Average:	3.04e-007 +-1.75e-008	5.09e-002	3 of 5
	74.97	2.95e-007 +-6.05e-007		
	510.84	3.66e-007 +-6.30e-008		
	583.14	2.99e-007 +-1.82e-008		
Pa-234	94.66	6.05e-007 +-1.24e-007	6.70e+000	1 of 14
Ra-226	186.10	I.D.Only	1.40e+007	1 of 1
Ac-228	Average:	9.63e-007 +-5.26e-008	6.13e+000	3 of 10
	338.32	1.09e-006 +-1.13e-007		
	911.07	9.53e-007 +-7.00e-008		
	969.11	8.66e-007 +-1.12e-007		
Ra-224	240.98	2.96e-006 +-3.30e-007	8.69e+001	1 of 1

Tl-210	298.00	2.97e-007 +-1.68e-008	2.17e-002	1 of	3
Bi-211	351.07	3.51e-006 +-1.19e-007	3.55e-002	1 of	1
Bi-214	Average:	1.16e-006 +-3.97e-008	3.32e-001	3 of	7
	609.31	1.10e-006 +-4.44e-008			
	1120.30	1.20e-006 +-1.37e-007			
	1764.50	1.50e-006 +-1.17e-007			
K-40	1460.80	8.56e-006 +-3.40e-007	1.12e+013	1 of	1
TOTAL:		2.50e-005 uCi/g			

UNKNOWN PEAKS

Energy (keV)	Centroid Channel	Net Counts	Un-Certainty	C.L. Counts	Bkg. Counts	FWHM (keV)	Net Gamma/sec
None							

STS CONSULTANTS

Addendum to Report for Results of Expanded Gamma Radiation Survey

STS Consultants, Ltd.
Solutions through Science & Engineering

October 2, 2001

Illinois Center Plaza Venture
An Illinois Limited Partnership
c/o Mr. Melvin Lippe
Altheimer & Gray
10 South Wacker Drive
Chicago, Illinois 60606-7482

Mr. James Loewenberg
Loewenberg and Associates
1 West Superior Street
Chicago, Illinois 60610

RE: Addendum to Report: Results of Expanded Gamma Radiation Survey, 26-Acre Site, 221 North Columbus Drive, Chicago, Illinois—STS Project No. 1-32193-XH

Dear Messrs. Lippe and Loewenberg:

As you know, the U.S. Environmental Protection Agency (USEPA) performed radiation screening at the Family Golf Center property located 221 North Columbus Drive (the Site). The Site is developed with a golf course on a 26-acre parcel located to the southwest of the intersection of Lake Shore Drive and (lower) Wacker Drive in Chicago, Illinois. The USEPA measured anomalous gamma radiation levels in portions of the Site and requested that a more extensive radiation survey be conducted.

RADIATION SURVEY

Illinois Center Plaza Venture, an Illinois Limited Partnership (as the current owner and seller of the Site) and Loewenberg and Associates (as a potential purchaser of the Site) retained STS Consultants, Ltd. (STS) to perform a radiation survey at the Site. The purpose of the survey was to further explore areas exhibiting elevated gamma radiation and to sample and document the extent of radioactive materials those areas. The result of this work was described in STS's report dated September 19, 2001.

Following issuance of the September 19, 2001 report, it was determined that several areas near the perimeter of the Site were not included in the radiation survey. The areas not included in the initial survey were primarily covered with pavement (asphalt traffic drives/parking areas, concrete and brick walkways and patios, etc.). It should be noted that the presence of pavement limits the effectiveness of the survey in that the gamma radiation is attenuated or shielded by overlying pavement As a result, the ability to detect anomalous gamma readings is somewhat diminished. Radiation screening conducted by the USEPA and (initially) by STS did not include paved areas or areas beneath floor slabs in buildings. STS subsequently re-mobilized to the Site to survey radiation in paved areas not included in previous rounds of screening.

We understand that portions of the Site will be developed separately, and as such, these areas warrant surface radiation screening. To that end, areas not included in previous radiation surveys were screened, regardless of whether the area was paved or not. While the pavement diminishes the certainty of detecting elevated gamma readings, it may be possible to identify anomalies where gamma readings are sufficiently above the surrounding (background) readings. To this end, additional gamma radiation screening was conducted as described below.

EXPANDED RADIATION SURVEY

Field Methods

As with the previous survey work, STS laid out a 5 x 5-meter grid in areas not included in the initial survey. The grid coordinates used in the previous survey were correlated to the grid coordinates used to survey the remaining areas at the Site. A figure showing the limits of the expanded survey is attached.

The survey was conducted using a Ludlum 2221 rater-scaler and a 2 x 2 NaI probe. The probe was unshielded to provide for maximum sensitivity in the reconnaissance mode. The probe was held approximately 1 to 2 inches above the ground and the entire interior of each cell was walked. The highest reading at each grid cell was recorded in a field log.

Field Screening

Approximately 760 additional 5 x 5-meter grids were added to the radiation survey area, as described below:

Sampling Along the Western Perimeter. The largest area in the expanded radiation survey was the parking lot located at the western end of the Site along Columbus Drive where an additional 276 (complete or partial) grid cells were added to the surveyed area.

Sampling on North Field Drive and North Harbor Drive. Areas located on North Field Drive and on North Harbor Drive (near the southern perimeter of the Site) where an additional 102 grid cells and 108 grid cells, respectively, were surveyed.

Sampling Along Other Portions of the Perimeter. Around the remainder of the perimeter of the Site, 90 (whole or partial) cells were surveyed near the northwest corner of the Site where data had not previously been collected. An additional 26 cells were surveyed near the southwest corner; and approximately 156 (whole or partial) cells were surveyed near the southeast and east perimeter of the Site.

RESULTS OF EXPANDED FIELD SCREENING

Due to the presence of pavement over the majority of the newly surveyed areas, it is difficult to correlate the measurements to those taken in unpaved (unshielded) areas at the Site. The shielding by the pavement would suggest the counts per minute (CPM) value would be somewhat less than the CPM in the unpaved portions of the Site.

Comparative Evaluation

Measurements taken in unpaved areas at the Site were on the order of 6,000 to 9,000 CPM, with a cleanup standard of 20,000 CPM based on a calibrated standard. Conversely, measurements taken in paved areas at the Site were on the order of 4,000 to 7,000 CPM (about 30 percent less than in unpaved areas) suggesting cleanup standard of 13,000 to 15,000 CPM. However, this correlation is subject to considerable uncertainty and should only be used as a general qualitative indicator of the presence or absence of gamma contamination.

In evaluating the data, STS considered CPM trends observed in the paved areas, to assess the presence of anomalies (elevated gamma counts) beneath the pavement.

Readings Along the Western Perimeter. In the western parking lot, the background readings for the paved areas were typically in the 5,000 to 6,000 CPM range. The lowest values were in the low 4,000 CPM along the south side of the Commonwealth Edison substation. The highest values in this parking lot area were in the 9,000 to 10,000 CPM range at the northeast corner of the substation, at the northwest corner of the lot near the elevator, and at the northeast corner of the lot near the Golf Center building. These associations with buildings suggest the elevated readings may be the result of brick (a source of gamma radiation) or other construction materials influencing the readings. Similarly, the lowest readings could be from a thicker pavement or footing section, particularly where those low readings are immediately adjacent to the building wall.

Readings on North Harbor Drive. Measurements taken on Harbor Drive are generally in the 4,000 to 6,000 CPM range. The highest measurement in the paved section was 7,500 CPM. North Harbor Drive may have a thicker pavement section, in that the readings are lower, more in line with the parking lot to the west.

Readings on North Field Drive. The readings on North Field Drive range from approximately 6,000 to 8,000 CPM, with low readings in the upper 5,000 CPM range and a high reading of 11,000 CPM. Again, none of these readings appear sufficiently high to be indicative of a localized area of gamma contamination.

Readings Along Other Portions of the Perimeter. The remainder of the perimeter areas consists of a mixture of paved paths, brick-paved patios and unpaved areas. Those areas exhibit a range of gamma readings somewhat lower than the remainder of the Site but still within the anticipated range. Values range from 4,000 CPM lows to upper 9,000 CPM highs, but are typically in the 5,000 to 7,000 CPM range. None of these areas exhibit evidence of elevated radioactivity indicative of contamination.

DATA INTERPRETATION AND CONCLUSIONS

Based upon the results of the expanded survey no additional areas of elevated gamma radiation indicative of contamination (twice background levels) have been identified at the Site. The areas found to be contaminated in the previous surveys (in unpaved areas) exhibited gamma readings in the 20,000 to 300,000 CPM range and higher. The expanded gamma radiation survey described herein did not identify areas with anomalous gamma readings (additional sources of radiation).

Considering the presence of pavement cover and the potential shielding affects, STS recommends that if future development or renovation activities remove existing pavements, gamma radiation screening should be conducted in paved areas exhibiting the highest gamma measurements.

These interpretations are based on our survey data and experience on similar sites in the immediate vicinity. No guarantee regarding the presence or absence of radiologically impacted soil or fill is intended, either expressed or implied, in the conclusions and findings in this letter report.

If you have any questions regarding the findings of this additional investigation or any other aspect of this project, please call with of the undersigned at (847) 279-2500.

Regards,

STS CONSULTANTS, LTD.

Stephen G. Torres, C.P.G.
Science Group Manager

Richard G. Berggreen, C.P.G.
Principal Geologist

Attachment

STS CONSULTANTS

Test Pit Exploration

THE INFRASTRUCTURE IMPERATIVE

STS Consultants, Ltd.
Solutions through Science & Engineering

January 8, 2002

Mr. David Carlins
Magellan Development Group, Ltd.
One West Superior, Suite 200
Chicago, Illinois 60610

Mr. Sean W. Bezark Esq.
Altheimer and Gray
10 South Wacker Drive
Chicago, Illinois 60606-7482

RE: Test Pit Exploration, 26-Acre Golf Course Site, Southwest Corner of Wacker Drive and Lake Shore Drive, Chicago, Illinois – STS Project No. 1-32193-YH

Dear Mr. Carlins and Mr. Bezark:

In accordance with our proposal of December 6, 2001 (STS Proposal No. 1-14892-PP), STS Consultants, Ltd. (STS) has completed test pit explorations at the above-referenced site. The objective of that work was to identify the approximate ground surface elevation of the site during the time the area was in use as a freight yard in the early part of the 1900s. That information is to be used to specify the areas to be drilled and the depth of exploration for areas where fill soil is present over the ground surface from the early 1900s. The fill thickness is to be determined in order to identify areas where fill thicker than two feet may be present. Former exploration of the site for elevated gamma radiation identified several locations with evidence of elevated radioactivity. That survey, however, would not detect radioactivity beneath a soil cover of more than two feet. Areas with fill greater than two feet will be explored through subsurface survey methods.

TEST PIT EXPLORATION LOCATIONS

Historical records of the site were reviewed to locate potential targets for identifying the former ground surface. Six locations for test pits were proposed, and five were subsequently excavated. The proposed locations were as follows:

Location A	Former railroad tracks adjacent to a scale house and Slip C, in the northwest part of the site.
Location B	Building foundation/floor slab of former cold storage warehouse near west end, south side of Slip D.
Location C	Brick pavement and south edge of Slip D immediately north of cold storage warehouses.
Location D	Paved driveway and former railroad tracks between cold storage warehouses and coal storage yard, north of Slip E. (Note: this location was not excavated due to interferences with irrigation system and location on tee area.)
Location E	Edge of slip at west end of Slip E.
Location F	Railroad tracks and canal edge of projected extension of Slip C.

These test pit locations are based on land use depicted on Sanborn Fire Insurance Maps dated 1906. Additionally, an elevation survey in approximately 1971 of the Illinois Central rail yard was reviewed by International Engineering Consultants. The rail yard elevation was reported to be approximately 7.1 feet Chicago City Datum (CCD).

Elevations from the test pit exploration results, discussed below, and from the railroad yard map were standardized to CCD elevations before developing the fill thickness map. Figure 1 shows the locations of the test pits on the current site. Figures 2a and 2b show the test pit locations superimposed on the Sanborn Fire Insurance Map from 1906.

TEST PIT FINDINGS

Location A

A thin cinder fill cover 12 to 18 inches thick was found, being somewhat thicker to the west. Timbers were found running north-south, possibly reflecting cribbing for the scale pit. Below the cinders was fine brown sand, apparently natural beach sand. No evidence of rail bed ballast, ties, or rails was noted in the test pit.

The ground surface elevation in this area is approximately 5.4 feet CCD. The base of the cinders was encountered at an elevation of 4.3 feet CCD. The former ground surface was not evident in this test pit.

Location B

The excavation encountered concrete with re-bar immediately below the ground surface. The north edge of the concrete is covered by cinder fill approximately 16 inches thick. Beneath the cinder fill a mixture of fine sand and cinders was encountered. The cinder fill is only a few inches thick over the sand.

The ground surface elevation in this area is 5.9 feet CCD. The bottom of the cinders was encountered at elevations of approximately 5.7 to 5.8 feet CCD. The thick cinder fill and presence of the concrete foundation at the ground surface suggests the former ground elevation was at or above approximately the current elevation of approximately 6.0 feet CCD.

Location C

This test pit was excavated to locate a brick pavement along the south edge of Slip D. Paving bricks were found in the upper 18 inches of the trench. These bricks are not in place but had been torn up and mixed with other materials. Below the material containing the bricks, cinder fill and rubble was encountered. Beneath the cinder fill a layer of what appeared to be an asphalt type pavement over a limestone basecourse was encountered. Pink common brick rubble was encountered beneath the asphalt and limestone.

Ground surface at the location of the test pit is 7.2 feet CCD. The elevation of the asphalt surface is 5.7 feet CCD. The elevation of the brick pavement is thus placed at between 6.0 and 7.0 feet CCD.

Location D

Location was not excavated.

Location E

This test pit was excavated at the west end of Slip E. Approximately 12 inches of mixed cinders and soil was found over a wooden structure. The wood appeared to be timbers rather than ties. The timbers are oriented both north-south and east-west. To the east, the test pit encountered fill soil and debris, with little or no timber or wood. West of the timbers, the fill consists of more brick and cinders. It appears the timber comprised a floor or decking and a wall at the west end of the slip.

The ground surface elevation at this test pit is 7.1 feet CCD. The elevation of the top of the timbers is approximately 6.3 feet CCD. This indicates the former ground surface was between 6.0 and 7.0 feet CCD at the edge of Slip E.

Location F

This test pit was excavated near a ridge of fill protecting a lighting fixture. The upper approximately two to three feet was rubble fill placed to form the protective ridge. This fill was underlain by cinder fill 12 to 18 inches thick. At that depth a wood timber was encountered. Miscellaneous fill with some staining was evident on the east side of the wood beam. A uniform gray silt fill soil was evident to the west of the timber. The material is interpreted such that the gray silt is fill from the former southern extension of Slip C. The miscellaneous fill material is on the land side of the slip wall.

The current ground surface at this location is 7.1 feet CCD. The elevation of the timber is 3.7 feet CCD. The slip wall is possibly lower as it had been filled in prior to the 1900s and is not representative of the ground elevation at that time. The cinder fill probably represents the former ground surface, but no distinct marker is evident below the more recent fill at an elevation of 4 to 5 feet CCD.

CONCLUSIONS

On the basis of these test pits, the best indications of the ground surface elevations suggest an early 1900s elevation of between 6.0 and 7.0 feet CCD. This agrees fairly well with the topography from the railyards in the 1970s with an elevation of approximately 7.0 feet CCD. In order to provide some level of conservatism based on the uncertainty of the data, STS has assumed that the lower elevation of the ground surface was 6.0 feet CCD.

On the basis of the shielding provided by soil over two feet thick, any fill at an elevation of greater than 8.0 feet CCD will be assumed sufficiently thick to potentially mask underlying radioactive material that could not be detected through a surface gamma survey.

We appreciate being of assistance on this project. Please contact the undersigned with any questions you may have regarding this matter.

Regards,

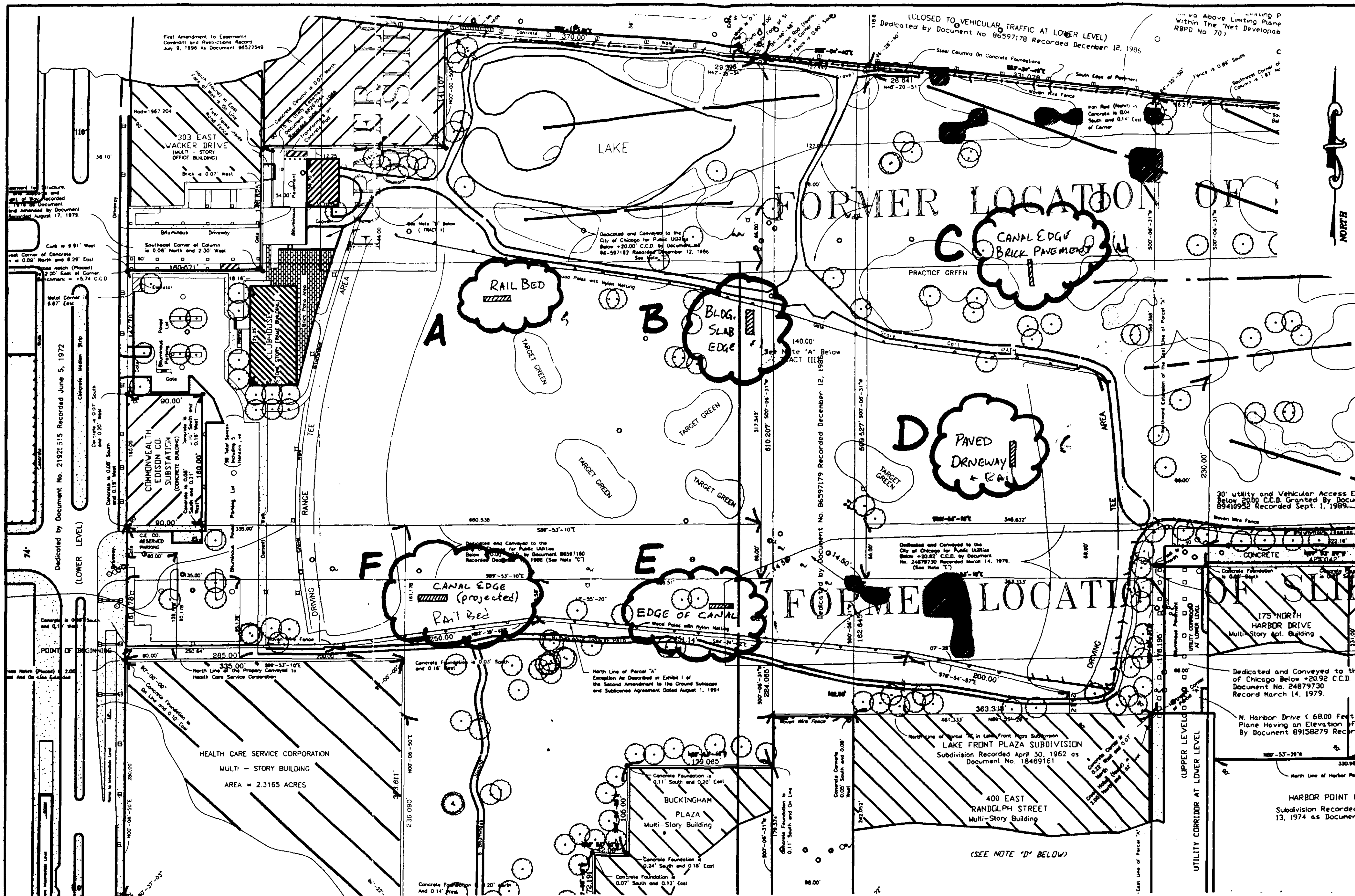
STS CONSULTANTS, LTD.

Stephen G. Torres, C.P.G.
Science Group Manager

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: James King, LaSalle National Bank
Fred Micke, USEPA

Attachments



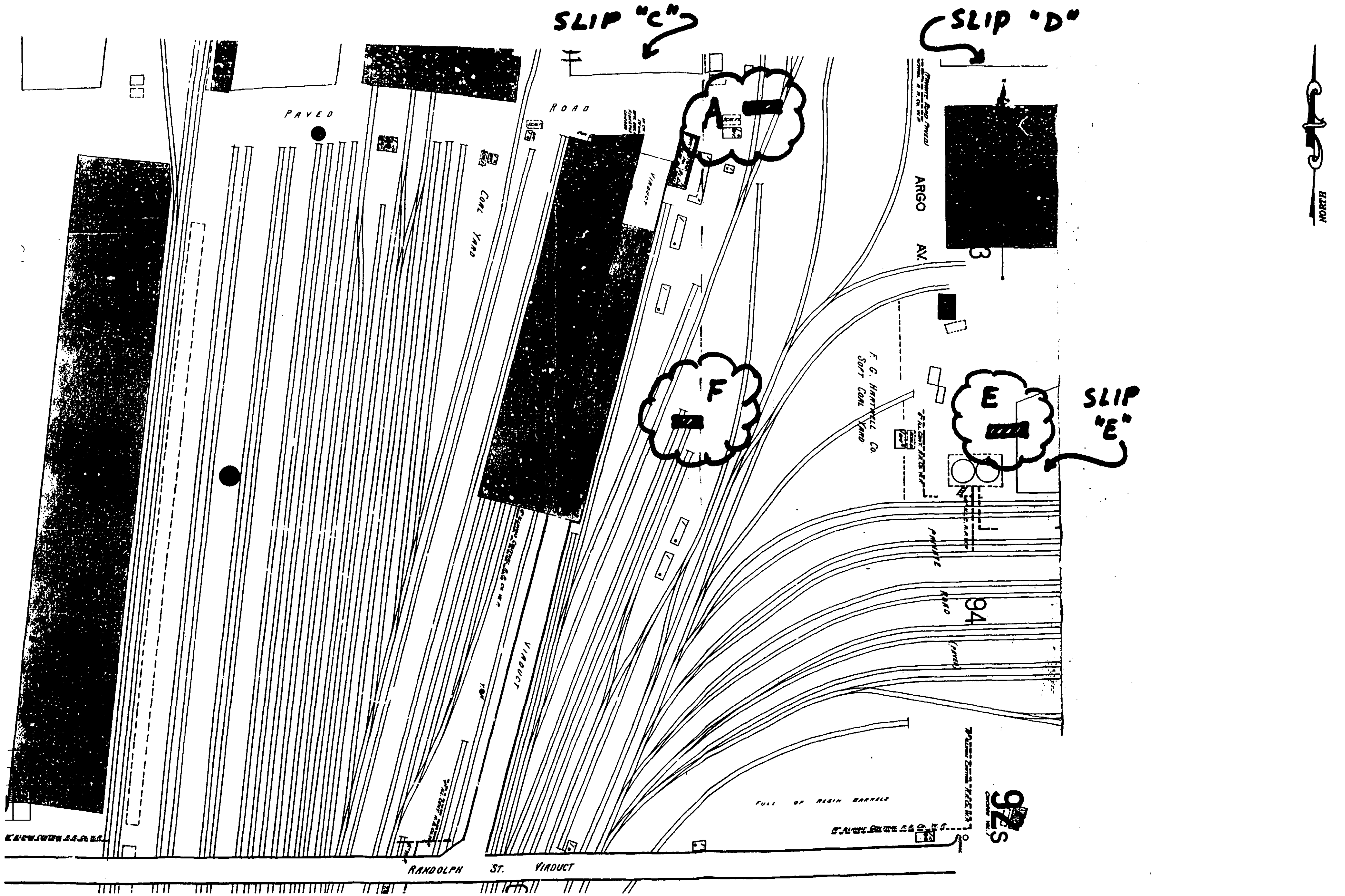
BASE MAP FROM INTERNATIONAL ENGINEERING CONSULTANTS, OCTOBER 18, 2001.

LAKESHORE EAST TEST PIT LOCATIONS
26 ACRE SITE
SWC WACKER DRIVE AND LAKE SHORE DRIVE
CHICAGO, ILLINOIS

DRAWN BY	RGB	DATE	1-31-02
CHECKED BY	KKB	DATE	1-31-02
APPROVED BY		DATE	
CADFILE			

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 32193-YH
STS PROJECT FILE
SCALE NTS
FIGURE NO. 1



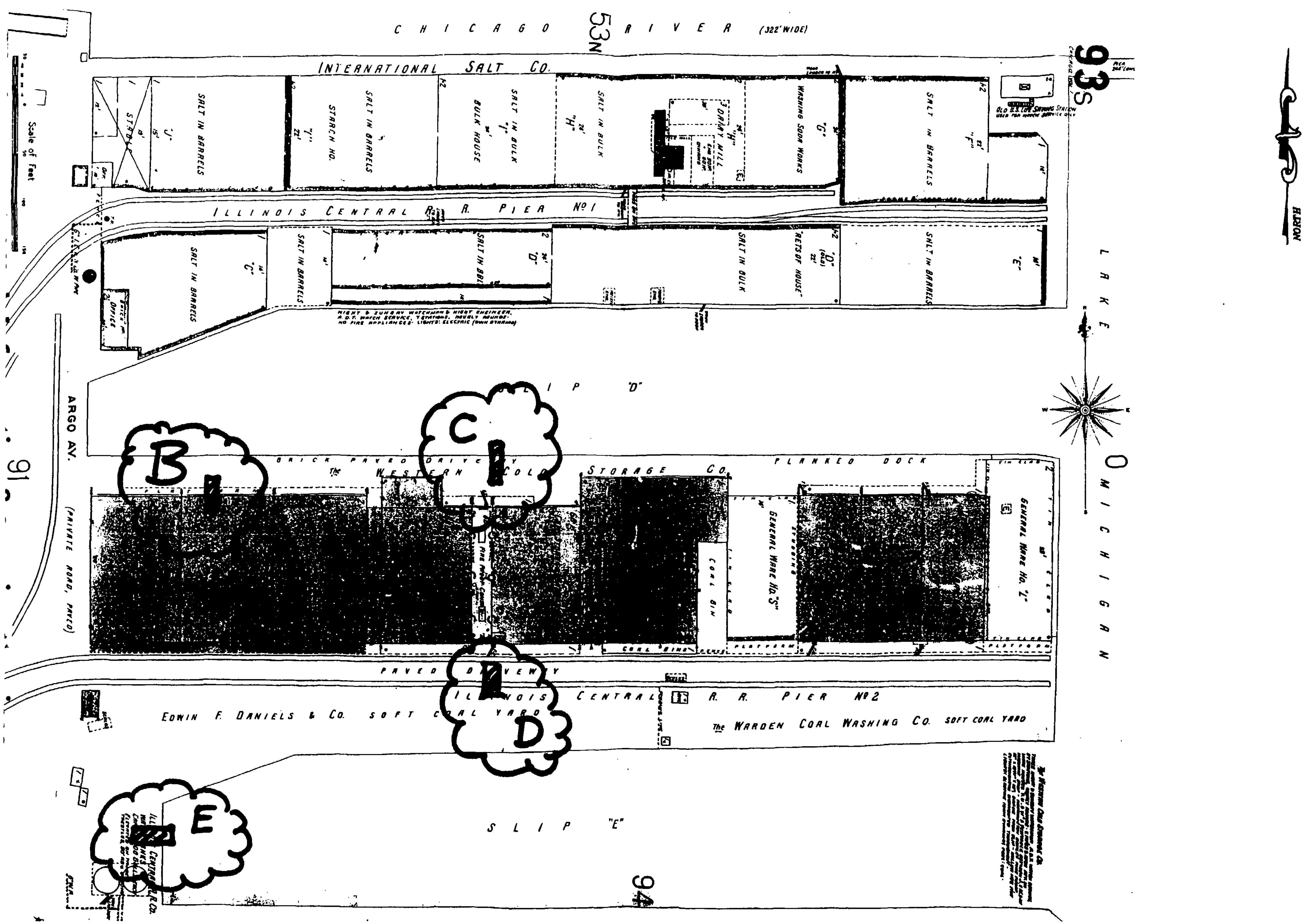
BASE MAP FROM SANBORN FIRE INSURANCE MAP, 1906.

LAKESHORE EAST TEST PIT LOCATIONS
26 ACRE SITE
SWC WACKER DRIVE AND LAKE SHORE DRIVE
CHICAGO, ILLINOIS

DRAWN BY KKB
DATE 1-31-02
CHECKED BY RGB
DATE 1-31-02
APPROVED BY
DATE
CADFILE

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 32193-YH
STS PROJECT FILE
SCALE NTS
FIGURE NO. 2A



BASE MAP FROM SANBORN FIRE INSURANCE MAP, 1906.

DRAWN BY	KKB	DATE	RGB
CHECKED BY		DATE	
APPROVED BY	1-31-02	DATE	1-31-02
CADFILE			

LAKESHORE EAST TEST PIT LOCATIONS
26 ACRE SITE
SWC WACKER DRIVE AND LAKE SHORE DRIVE
CHICAGO, ILLINOIS

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 32193-YH
STS PROJECT FILE
SCALE NTS
FIGURE NO. 2B

Final Report for the Lakeshore East Additional Radiation Survey Investigation

STS CONSULTANTS

STS CONSULTANTS, LTD.

Lakeshore East Additional Radiation Survey Investigation

Lakeshore East LLC
One West Superior, Suite 200
Chicago, Illinois 60610

STS Project No. 1-32193-ZH
February 8, 2002

THE INFRASTRUCTURE IMPERATIVE

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LAKESHORE EAST ADDITIONAL RADIATION SURVEY INVESTIGATION

EXECUTIVE SUMMARY

Previous investigations by U.S. Environmental Protection Agency (USEPA) and STS Consultants, Ltd. (STS) have identified radiologically impacted soil. Surface surveys and subsurface investigations which included 35 borings found an estimated 1,000 cubic yards (CY) of impacted soil. An additional 271 borings were drilled for this investigation, covering the thicker fill areas and the former slips. This most recent additional investigation identified an additional 10 to 15% impacted material. The comprehensive explorations of the site, including the surface surveys and subsurface explorations, have found a total of approximately 1,136 CY of impacted material. Recognizing that some additional impacted material may be found beyond that identified and calculated herein, a conservative estimate is reached by doubling the identified volume. This factor of 2 results in an impacted volume estimate of 2,270 CY. Estimating the transport and disposal at $1,000/CY and $567,000 for engineering, monitoring, documentation, and closure, these estimates total $2,837,000.

1.0 INTRODUCTION

The Lakeshore East site is an approximately 26-acre property located at the southwest corner of Wacker Drive and Lake Shore Drive in Chicago, Illinois (the Site). The Site is currently in use as a golf center including a driving range and nine-hole golf course (Figure 1). The Site is being investigated as part of a proposed residential development. Previous investigations by STS Consultants, Ltd. (STS) and others have found evidence of elevated radioactivity at certain locations within the site. The purpose of the investigations described herein is to identify radiologically impacted locations, assess the extent of the radiologically impacted materials, and provide a volume estimate of the impacted materials so as to estimate the potential costs attendant on addressing that material.

2.0 PREVIOUS WORK

Several previous investigations for radiologically impacted soils have been conducted at this site. The U.S. Environmental Protection Agency (USEPA) conducted a walkover survey of a portion of the site and identified two or possibly three locations with elevated gamma radiation (USEPA correspondence dated July 2 and 3, 2001).

STS conducted a walkover survey of the entire property on a 5-meter grid. This survey also identified certain locations exhibiting elevated gamma radiation which were consistent with the USEPA findings. Borings, step-out borings, down-hole gamma surveys, and radiological analysis of soil samples were conducted to document the apparent extent of the radiologically impacted material. The report of that investigation was dated September 19, 2001, with an addendum letter report dated September 28, 2001.

Recently, a review of historical records was conducted accompanied by the excavation of several test pits. That exploration was for the purpose of investigating the thickness of fill materials present on the site that could have been placed after approximately the early 1900s. A summary report of those investigations was prepared and was dated January 8, 2002. A copy of that report is attached, Attachment A.

3.0 PROJECT BACKGROUND

Radiologically impacted locations have been identified on the subject site (USEPA, July 2001; STS, September 2001). The identification of buried radioactive materials from surface surveys is constrained by the presence of soil cover of more that about two feet that can shield radioactive material from detection. Both the developers and proposed lenders raised the question whether some of the golf course grading may have covered impacted soils with sufficient cover to render them non-detectable from the ground surface. In response to that question, an evaluation of the fill thickness was undertaken. The ground surface dating from about 1900 was proposed to be researched to establish the ground surface elevation before the industrial use of the radioactive materials was begun in the site vicinity. This off-site industrial use at a lamp mantle factory operated by Lindsay Light Company is the suspected source of the radioactive soil on site.

The apparent historical site ground surface elevation was evaluated and described in STS's report dated January 2002. Additionally, a fill thickness map was subsequently developed by comparing the 1900 site grade to the current site topography. The resulting fill thickness map identified those areas where the fill was in excess of 2 feet thick and therefore could potentially mask the presence of radioactive soil from detection by a surface survey. A copy of this fill thickness map is included as Attachment A. This report presents the findings of the exploration of those thicker fill areas.

STS's review of historical records also identified the former presence of several shipping slips on the site. The slips extended from the Chicago River south into the site (Slip C), and from Lake Michigan west into the site (Slips D and E). The locations of these former slips are shown on Figure 1. Sanborn Fire

Insurance maps show these slips in 1906. The slips had been filled and were no longer present on site in the 1929 Sanborn maps. This time frame for filling the slips is concurrent with the nearby Lindsay Light manufacturing operations that used the radioactive materials. During this time radioactive by-product materials may have been included in the fill placed in the slips. Additionally, the surface radioactivity survey that found the evidence of several areas of elevated gamma radiation showed those locations to be near or within the outlines of two of the former slips (Slips D and E). As a result of the concurrent timing of the filling of the slips and the operations using the radioactive materials, close proximity of the Lindsay Light operations, and the geographic association between the identified radioactivity and the slips, it was requested that additional exploration of the slips be conducted. This report presents the scope, findings, and conclusions of that investigation.

4.0 SCOPE OF WORK

Three sets of borings were drilled as part of this investigation. These consisted of:

1. Fill thickness borings (100-series) scattered across the site to sample the fill soil that is thicker than two feet
2. Slip grid borings drilled on a 10-meter spacing across the former slips
3. Step-out borings around those grid borings exhibiting elevated radioactivity

Each of these sets of borings is described below.

4.1 Borings Drilled to Assess Fill Thickness

The fill thickness borings were located so as to explore those locations with the thickest fill above the former 1900 ground surface, based on the current topography. A total of 22 (fill thickness) borings were drilled, and are numbered 100 through 122 on Figure 2. The borings ranged from 4 to 10 feet deep and were intended to extend a minimum of 1 foot below the 1900 ground surface elevation. Some of the borings had to be moved to avoid drilling on the golf course greens or to avoid subsurface utilities. All borings were drilled with a nominal 4.25-inch diameter hollow stem auger. A 3-inch diameter PVC casing was installed in each hole, and gamma readings were taken in 6-inch increments. The gamma logging was conducted with a Ludlum 2221 rater-scaler and a 2 x 2 NaI probe. The probe was equipped with a 1-inch thick lead end cap at the lower end of the probe to minimize the influence of adjacent deeper radioactive materials on the gamma readings.

4.2 Borings Drilled in Former Slips

The slip grid borings were drilled on a 10-meter grid over the entire extent of the slips, as the slips were mapped from the 1906 Sanborn maps. (Note the 10-meter grid, equal to approximately 33 feet, is used as a result of the USEPA use of metric measures in their surveying and sampling. Other than the grid spacing, feet and inches are used herein to reference depths and distances.) A total of 215 borings were drilled to examine the slip areas. Borings in Slip C, D, and E are designated with a letter indicating the slip and a number indicating the boring number (i.e., C-1 reflects Slip C, boring 1). The boring layout is shown on Figure 2. Several borings had to be eliminated due to conflicts with utilities crossing the site, and to avoid the golf course greens. Where possible, the borings were moved as opposed to being eliminated. As with the fill thickness borings, these borings were cased with 3-inch PVC pipe and gamma logged in 6-inch increments using a Ludlum 2221 and a 2 x 2 NaI probe with a 1-inch lead end shield.

The slip grid borings extended to a depth of 12 feet. This depth is the limit allowed by the Chicago Board of Underground. The need to identify and delineate deeper radiologically impacted soil is lessened, as the deeper radioactive soil is sufficiently shielded by the overlying soil and groundwater, so as to represent no hazard to the use of the ground above any residual contamination. On a vicinity site where radiologically impacted soil was previously removed, the USEPA allowed impacted soil to remain at a depth of 12 feet and greater, where this soil was below the groundwater table and could not practically be excavated. It was a condition of the allowance that in the event deeper excavation was pursued, the remaining soil would require appropriate management and disposal. In that the groundwater table at the subject site is at approximately 8 to12 feet deep, impacted soil below the 12 foot depth may be allowed to remain in place. That determination, however, will need to be made by USEPA.

4.3 Step-Out Borings

The third set of borings includes arrays of borings positioned around those grid borings where evidence of elevated gamma radiation was noted in the down-hole logging. These borings, referred to as step-out borings, are for the purpose of identifying the lateral extent of the radiologically impacted soil noted in the grid boring. These step-out borings are designated with a letter post-script to the boring number, i.e. E-56B is in slip E at grid boring location 56 and is step-out boring B. Step-out borings were made in four directions at 2.5-meter (8-foot) increments. No more than two step-outs would be made in any one direction, as this would provide for halving the distance to the next grid boring, approximately. As with the initial grid borings, several of the step-out boring locations conflicted with underground utility locations or would have required drilling on the golf course greens, and were therefore not drilled. The step-out borings were also down-hole logged in 6-inch increments using the same equipment.

With all of the borings, when down-hole logging or screening of the borehole cuttings indicated the presence of elevated radioactivity, the cuttings were collected and placed in a Supersack container. Those cuttings were collected and remain on site in a secure location pending disposal at a permitted facility.

All determinations of elevated radioactivity were made through the down-hole gamma measurements.

5.0 FINDINGS

Figure 3 presents the results of the drilling and down-hole logging, shows the layout of the step-out borings, and identifies both the previously located radiologically impacted areas and the areas identified in this investigation. The down-hole logs are presented in Attachment B. No additional locations exhibiting elevated radioactivity were identified in the borings scattered through the thicker fill sections outside the slips. No elevated gamma readings were noted in the borings drilled in Slip C near the northwest corner of the site. One additional area was identified in Slip E and five additional areas were identified in Slip D. Several of the grid borings encountered the radioactive materials previously documented in the earlier investigations. A discussion of these detections is presented below.

The gamma readings referred to below are 30 second counts. The clean-up threshold numbers, as determined by measurements against a calibrated material, are either 15,894 counts or 18,059 counts per 30 seconds, depending on the specific instrument used. These counts reflect a 7.2 pCi/g total radium level consistent with the USEPA standard applied to other nearby properties. The down-hole logs in Attachment B indicate the threshold for each specific borehole logged.

In Slip E, only one grid boring outside of previously identified radiologically impacted areas showed evidence of elevated gamma radiation. Boring E-56 showed elevated readings from 4.5 to 6.5 feet below ground surface (bgs) with a maximum reading of 129,630 counts in 30 seconds at 5.5 to 6 feet bgs. Boring E-56A shows elevated readings from 4.5 to 8.5 feet bgs with a maximum of 273,156 counts in 30 seconds at 6 to 6.5 feet bgs. The other step-out borings, E-56B, -C, -D, and -E, all show readings below the threshold for contamination. The step-out boring locations are shown on Figure 3.

In Slip D, five grid borings encountered elevated radioactivity outside previously identified locations. Boring D-10 showed elevated gamma readings from 4 to 6 feet, with a reading of 115,880 counts in 30 seconds at 4.5 to 5 feet bgs. Step-out borings D-10A, -B, and -C showed no elevated gamma readings.

The fourth side of the step-outs was constrained by the presence of a golf course green to the south and the limit of the slip in that direction.

Boring D-34 showed elevated readings from 5 to 6.5 feet bgs, with a maximum reading of 108,780 counts in 30 seconds at 5.5 to 6 feet bgs. Step-out borings D-34A, -B, and -C were all below the threshold for contamination. The fourth step-out was constrained by underground utilities to the north. The next boring to the north, D-61, was clean.

Boring D-71 showed elevated readings from 3.5 to 11 feet bgs. The highest reading was 610,257 counts in 30 seconds at 8.5 to 9 feet bgs. Step-out boring D-71D showed elevated readings above the threshold from 7 to 9 feet bgs. The other step-out borings showed some elevated readings above the apparent background gamma counts, but none above the clean-up threshold.

Boring D-77 showed a thin zone from 5 to 6.5 feet bgs with a maximum reading of 37,886 counts in 30 seconds from 5.5 to 6 feet bgs. No other elevated readings were noted in any of the three step-outs completed. The fourth step-out boring, which is to the north, was constrained by the location adjacent to a golf course green. The next two borings in that direction, D-105 and D-106, were clean.

Boring D-94 showed elevated readings from 2 to 4 feet bgs. The highest reading was 69,116 counts per 30 seconds at 3 to 3.5 feet bgs. Step-out boring D-94A had similar readings from 2 to 4.5 feet bgs with a high of 75,027 counts per 30 seconds at 3 to 3.5 feet bgs. Step-out boring D-94D showed elevated readings from 0.5 to 3 feet bgs, with a maximum reading of 197,267 counts per 30 seconds at 1.5 to 2 feet bgs. The surrounding step-out borings D-94B, -C, -E, and -F are all below the clean-up threshold.

Some other borings encountered elevated radioactivity, including E-22, E-25, and D-125. These borings, however are within or immediately adjacent to some of the locations previously found to be radiologically impacted in the surface survey drilling and analytical program, the findings of which were presented in the September 2001 STS report.

The locations of the impacted borings or previously identified impacted areas were surveyed using a global positioning system (GPS). Surveyed (GPS) locations are within 1 meter accuracy. The GPS locations are provided in Attachment C.

6.0 VOLUME CALCULATIONS

Table 1 below, presents a summary of the detections, the thicknesses and depths determined from this investigation. These values are used in the following section to calculate the apparent volume of impacted soil identified at each of the newly discovered locations.

Table 1
Detections of Impacted Soil

Boring No.	Depth Interval (ft bgs)	Gamma Counts (Maximum, 30 seconds)
D-10	4 – 6	115,880 [2]
D-34	5 – 6.5	108,780 [1]
D-21	3.5 – 11	610,257 [2]
D-21D	7 – 9	87,027 [2]
D-77	5 – 6.5	37,886 [2]
D-94	2 – 4	69,116 [1]
D-94A	2.5 – 4	75,027 [2]
D-94D	0.5 – 3	197,267 [1]
E-56	4.5 – 6.5	129,630 [1]
E-56A	4.5 – 8.5	273,156 [1]

1 Cut-off for 7.2 pCi/g = 15,894 counts/30 seconds
2 Cut-off of 7.2 pCi/g = 18,059 counts/30 seconds

6.1 Assumptions

Certain assumptions were used in calculating the volumes of radiologically impacted soil. In that gamma radiation can penetrate soil for some limited distance, a layer of radioactive material may cause elevated readings some distance above and below the actual radioactive material. This is referred to as "shine". For the purpose of these calculations, "shine" was ignored, which would tend to result in an over-estimation of the impacted volume. Additionally, recognizing that excavation will tend to somewhat homogenize the soil, and a larger volume will likely be excavated than the actual limit of radioactivity, the excavated thickness was increased by 6 inches above and 6 inches below the intervals where readings exceeded the cleanup threshold. Finally with regard to thickness, the thickest impacted section in a cluster of borings and step-outs was used, which will also tend to overestimate the actual excavated volume.

A rectangular area was assumed for the material to be removed. The precise shape of the impacted zones is unknown, and the rectangular area is conservative and simplified the calculations.

The horizontal limits were set half way between a clean boring and the last impacted boring. At locations where the limit could not be drilled due to utility or other constraints, the next boring (the one not drilled) was assumed to exceed the cleanup threshold for purposes of estimating volume.

6.2 Calculations

No revision was made to the previously calculated impacted soil volumes. Those calculations used similar assumptions and had a similar boring density at the locations explored. That calculated volume was approximately 1,000 CY. The following table presents the calculated volume based on the observed thickness and areal extent.

Boring No.	Interval with Exceedance of Gamma Values (feet bgs)	Calculated Thickness (6 inches added above and below (feet)	Area of Exceedance ft^2	Calculated Volume ft^3	Cubic Yards
D-10	4 – 6	3	8 x 16 = 128 ft^2	384	~ 15
D-34	5 – 6.5	2.5	8 x 16 = 128 ft^2	320	~ 12
D-71	3.5 – 11	8.5	8 x 16 = 128 ft^2	1,088	~ 40
D-71D	7 – 9				
D-77	5 – 6.5	2.5	8 x 16 = 128 ft^2	320	~ 12
D-94	2 – 4	3.5	16 x 16 = 256 ft^2	896	~ 33
D-94A	2.5 – 4				
D-94D	0.5 – 3				
E-56	4.5 – 6.5	5	8 x 16 = 128 ft^2	640	~ 24
E-56A	4.5 – 8.5				
Total					136 CY

The calculated volume of impacted soil identified is 136 CY for the recently completed investigation. In combination with the previously identified 1,000 CY, an approximate total volume of 1,136 CY is calculated.

In an effort to provide a level of certainty that the estimate of the volume of soil to be removed will not be exceeded, and based upon experience in other removal projects, it is assumed the volume of soil will be greater than the volume calculated from the observed exceedances despite the conservative assumptions used. Further, this estimate recognizes the excavated volume will "bulk" relative to the in place volumes used in the calculations. For the purpose of this estimate, and to be conservative, the volume calculated is estimated to double by the time the limits of impacted soil are reached. This factor of 2 results in an estimate of 2,270 CY of material that will require removal based upon the investigations completed and referenced herein.

7.0 CONCLUSIONS

Based on the results of this investigation and the investigations previously completed by STS, the radiologically impacted soil appears to be restricted to two localized areas. These areas are within or in close proximity to the former locations of Slips D and E. The volume of impacted soil identified using the data developed, and including several assumptions that would tend to overestimate the amount of impacted soil resulted in an estimate of 1,136 CY. It is anticipated that additional soil, beyond that identified in these previous explorations, will be found and may require removal. In order to provide a conservative estimate of the probable maximum volume of impacted soil to be removed, the volume estimate calculated from the available data was doubled. This results in an estimate of 2,270 CY of impacted soil that may be removed from the site.

The estimated cost for transport and disposal is in the range of $1,000 per cubic yard, which calculates to approximately $1,136,000. If this volume and resulting cost is doubled ($2,270,000) with an estimated 25% cost for engineering, monitoring, documentation, and closure ($567,000), a conservative total of $2,837,000 results.

Attachment A

Test Pit Investigation, Fill Isopach Map

STS Consultants, Ltd.
Solutions through Science & Engineering

January 8, 2002

Mr. David Carlins
Magellan Development Group, Ltd.
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Chicago, Illinois 60606-7482

RE: Test Pit Exploration, 26-Acre Golf Course Site, Southwest Corner of Wacker Drive and Lake Shore Drive, Chicago, Illinois – STS Project No. 1-32193-YH

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Location B	Building foundation/floor slab of former cold storage warehouse near west end, south side of Slip D.
Location C	Brick pavement and south edge of Slip D immediately north of cold storage warehouses.
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Location A

A thin cinder fill cover 12 to 18 inches thick was found, being somewhat thicker to the west. Timbers were found running north-south, possibly reflecting cribbing for the scale pit. Below the cinders was fine brown sand, apparently natural beach sand. No evidence of rail bed ballast, ties, or rails was noted in the test pit.

The ground surface elevation in this area is approximately 5.4 feet CCD. The base of the cinders was encountered at an elevation of 4.3 feet CCD. The former ground surface was not evident in this test pit.

Location B

The excavation encountered concrete with re-bar immediately below the ground surface. The north edge of the concrete is covered by cinder fill approximately 16 inches thick. Beneath the cinder fill a mixture of fine sand and cinders was encountered. The cinder fill is only a few inches thick over the sand.

The ground surface elevation in this area is 5.9 feet CCD. The bottom of the cinders was encountered at elevations of approximately 5.7 to 5.8 feet CCD. The thick cinder fill and presence of the concrete foundation at the ground surface suggests the former ground elevation was at or above approximately the current elevation of approximately 6.0 feet CCD.

Location C

This test pit was excavated to locate a brick pavement along the south edge of Slip D. Paving bricks were found in the upper 18 inches of the trench. These bricks are not in place but had been torn up and mixed with other materials. Below the material containing the bricks, cinder fill and rubble was encountered. Beneath the cinder fill a layer of what appeared to be an asphalt type pavement over a limestone basecourse was encountered. Pink common brick rubble was encountered beneath the asphalt and limestone.

Ground surface at the location of the test pit is 7.2 feet CCD. The elevation of the asphalt surface is 5.7 feet CCD. The elevation of the brick pavement is thus placed at between 6.0 and 7.0 feet CCD.

Location D

Location was not excavated.

Location E

This test pit was excavated at the west end of Slip E. Approximately 12 inches of mixed cinders and soil was found over a wooden structure. The wood appeared to be timbers rather than ties. The timbers are oriented both north-south and east-west. To the east, the test pit encountered fill soil and debris, with little or no timber or wood. West of the timbers, the fill consists of more brick and cinders. It appears the timber comprised a floor or decking and a wall at the west end of the slip.

The ground surface elevation at this test pit is 7.1 feet CCD. The elevation of the top of the timbers is approximately 6.3 feet CCD. This indicates the former ground surface was between 6.0 and 7.0 feet CCD at the edge of Slip E.

Location F

This test pit was excavated near a ridge of fill protecting a lighting fixture. The upper approximately two to three feet was rubble fill placed to form the protective ridge. This fill was underlain by cinder fill 12 to 18 inches thick. At that depth a wood timber was encountered. Miscellaneous fill with some staining was evident on the east side of the wood beam. A uniform gray silt fill soil was evident to the west of the timber. The material is interpreted such that the gray silt is fill from the former southern extension of Slip C. The miscellaneous fill material is on the land side of the slip wall.

The current ground surface at this location is 7.1 feet CCD. The elevation of the timber is 3.7 feet CCD. The slip wall is possibly lower as it had been filled in prior to the 1900s and is not representative of the ground elevation at that time. The cinder fill probably represents the former ground surface, but no distinct marker is evident below the more recent fill at an elevation of 4 to 5 feet CCD.

CONCLUSIONS

On the basis of these test pits, the best indications of the ground surface elevations suggest an early 1900s elevation of between 6.0 and 7.0 feet CCD. This agrees fairly well with the topography from the railyards in the 1970s with an elevation of approximately 7.0 feet CCD. In order to provide some level of conservatism based on the uncertainty of the data, STS has assumed that the lower elevation of the ground surface was 6.0 feet CCD.

On the basis of the shielding provided by soil over two feet thick, any fill at an elevation of greater than 8.0 feet CCD will be assumed sufficiently thick to potentially mask underlying radioactive material that could not be detected through a surface gamma survey.

We appreciate being of assistance on this project. Please contact the undersigned with any questions you may have regarding this matter.

Regards,

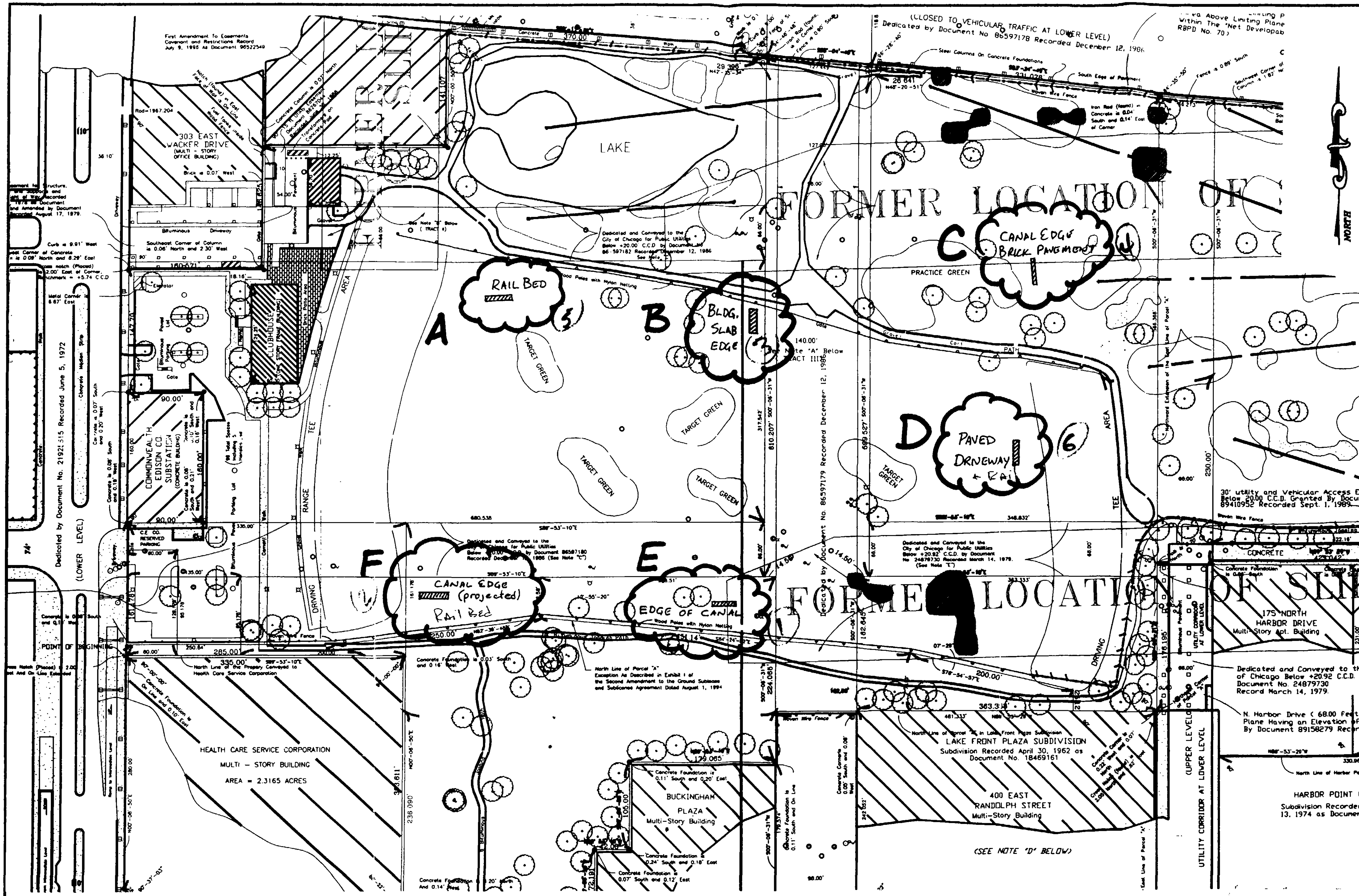
STS CONSULTANTS, LTD.

Stephen G. Torres, C.P.G.
Science Group Manager

Richard G. Berggreen, C.P.G.
Principal Geologist

cc: James King, LaSalle National Bank
Fred Micke, USEPA

Attachments



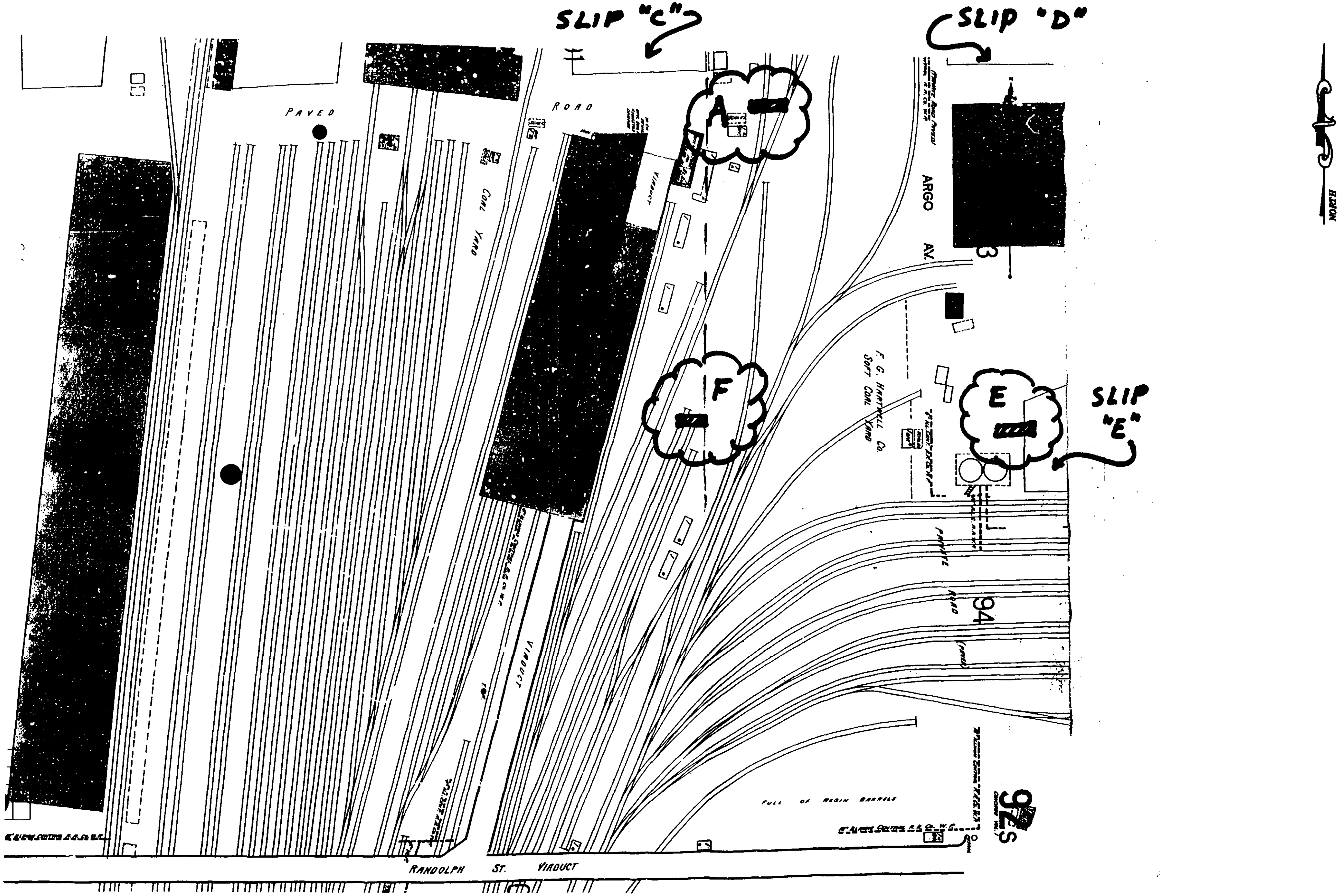
BASE MAP FROM INTERNATIONAL ENGINEERING CONSULTANTS, OCTOBER 18, 2001.

DRAWN BY KKB DATE 1-31-02
CHECKED BY RGB DATE 1-31-02
APPROVED BY DATE
CADFILE

LAKESHORE EAST TEST PIT LOCATIONS
26 ACRE SITE
SWC WACKER DRIVE AND LAKE SHORE DRIVE
CHICAGO, ILLINOIS

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 32193-YH
STS PROJECT FILE
SCALE NTS
FIGURE NO. 1



BASE MAP FROM SANBORN FIRE INSURANCE MAP, 1906.

DRAWN BY	KKB
DATE	RGB
CHECKED BY	
DATE	
APPROVED BY	1-31-02
DATE	1-31-02
CADFILE	

LAKESHORE EAST TEST PIT LOCATIONS
26 ACRE SITE
SWC WACKER DRIVE AND LAKE SHORE DRIVE
CHICAGO, ILLINOIS

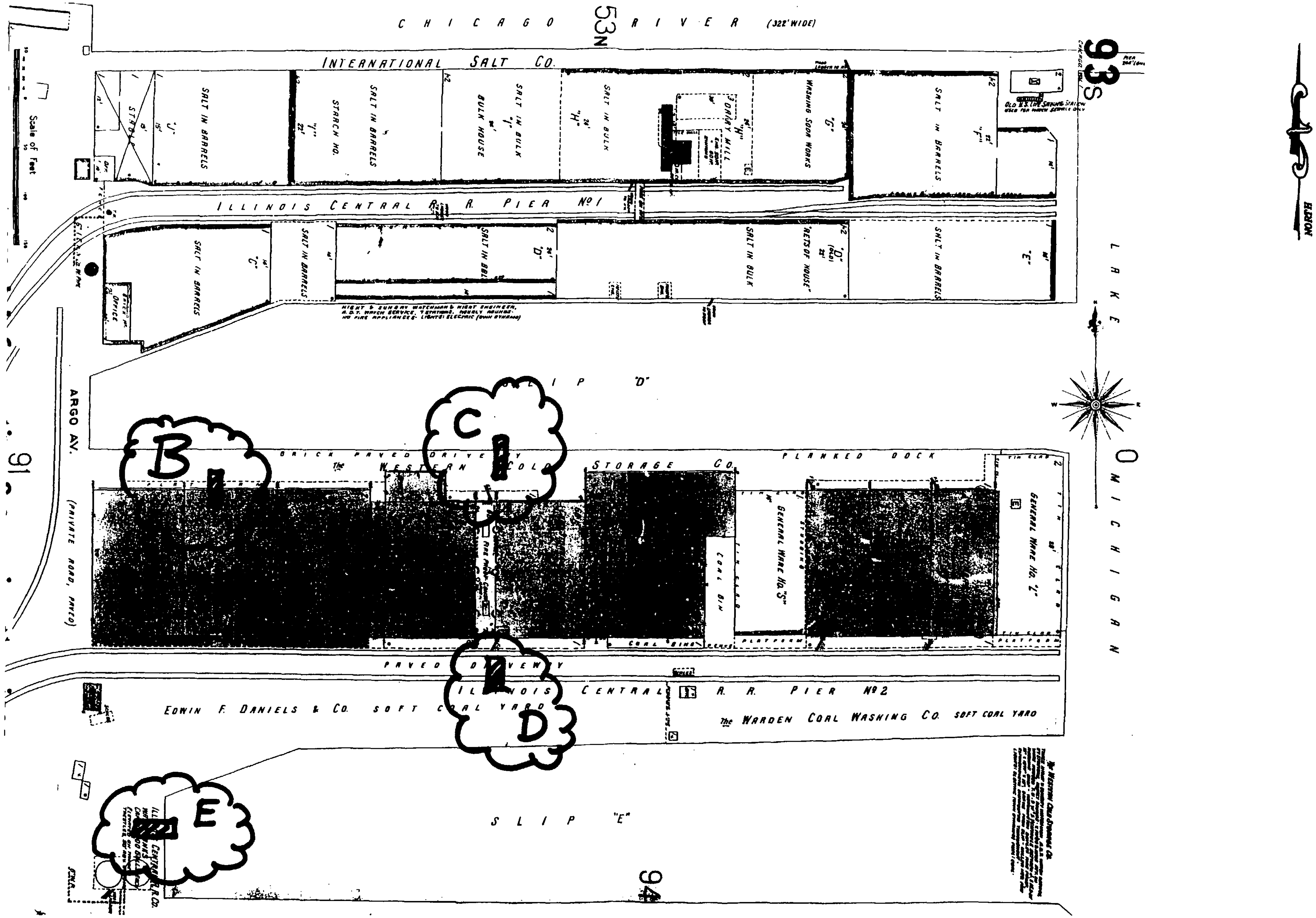
STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO. 32193-YH

STS PROJECT FILE

SCALE NTS

FIGURE NO. 2A



BASE MAP FROM SANBORN FIRE INSURANCE MAP, 1906.

DRAWN BY	KKB
DATE	1-31-02
CHECKED BY	
DATE	
APPROVED BY	RGB
DATE	1-31-02
CADFILE	

LAKESHORE EAST TEST PIT LOCATIONS
26 ACRE SITE
SWC WACKER DRIVE AND LAKE SHORE DRIVE
CHICAGO, ILLINOIS

STS Consultants Ltd.
Consulting Engineers

STS PROJECT NO.	32193-YH
STS PROJECT FILE	
SCALE	NTS
FIGURE NO.	2B

Attachment B

Downhole Gamma Logs

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19022

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-1
Maximum Depth 12 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3422	15.5	
1	3989	16	
1.5	4058	16.5	
2	4031	17	
2.5	3859	17.5	
3	3963	18	
3.5	3939	18.5	
4	4071	19	
4.5	4182	19.5	
5	4756	20	
5.5	4277	20.5	
6	3896	21	
6.5	3620	21.5	
7	3791	22	
7.5	3927	22.5	
8	4866	23	
8.5	5693	23.5	
9	5899	24	
9.5	4981	24.5	
10	4295	25	
10.5	4444	25.5	
11	4243	26	
11.5	3991	26.5	
12	4027	27	
12.2	4110	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19022

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-2

Maximum Depth 12 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3212	15.5	
1	3065	16	
1.5	3611	16.5	
2	3954	17	
2.5	3901	17.5	
3	3548	18	
3.5	3643	18.5	
4	3606	19	
4.5	3807	19.5	
5	3768	20	
5.5	3912	20.5	
6	3720	21	
6.5	3800	21.5	
7	3517	22	
7.5	3044	22.5	
8	3099	23	
8.5	3814	23.5	
9	3821	24	
9.5	3620	24.5	
10	3516	25	
10.5	3337	25.5	
11	3318	26	
11.5	3207	26.5	
12	3267	27	
12.4	3496	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19022

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-3

Maximum Depth 12 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3750	15.5	
1	3695	16	
1.5	3753	16.5	
2	3447	17	
2.5	3270	17.5	
3	3304	18	
3.5	3397	18.5	
4	3435	19	
4.5	3497	19.5	
5	3382	20	
5.5	3516	20.5	
6	3498	21	
6.5	3314	21.5	
7	3472	22	
7.5	3187	22.5	
8	2982	23	
8.5	3001	23.5	
9	3108	24	
9.5	3306	24.5	
10	3498	25	
10.5	3927	25.5	
11	3989	26	
11.5	4020	26.5	
12	4290	27	
12.5	4727	27.5	
12.8	4914	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19022

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-4
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2934	15.5	
1	3979	16	
1.5	4821	16.5	
2	5505	17	
2.5	5939	17.5	
3	5904	18	
3.5	6077	18.5	
4	5713	19	
4.5	5372	19.5	
5	5359	20	
5.5	5451	20.5	
6	5190	21	
6.5	4553	21.5	
7	4582	22	
7.5	7275	22.5	
8	7900	23	
8.5	6875	23.5	
9	5745	24	
9.5	6173	24.5	
10	6062	25	
10.5	6932	25.5	
11	7609	26	
11.5	5854	26.5	
12	4871	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19022

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-5
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4017	15.5	
1	4612	16	
1.5	5057	16.5	
2	5391	17	
2.5	5426	17.5	
3	5298	18	
3.5	5450	18.5	
4	6004	19	
4.5	6923	19.5	
5	6784	20	
5.5	6131	20.5	
6	5802	21	
6.5	5959	21.5	
7	5662	22	
7.5	5148	22.5	
8	5435	23	
8.5	7271	23.5	
9	7356	24	
9.5	7775	24.5	
10	8667	25	
10.5	7989	25.5	
11	7782	26	
11.5	7012	26.5	
11.10	6644	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19022

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-6
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4914	15.5	
1	3959	16	
1.5	4065	16.5	
2	4512	17	
2.5	5152	17.5	
3	4809	18	
3.5	5371	18.5	
4	5879	19	
4.5	5702	19.5	
5	4997	20	
5.5	5550	20.5	
6	5890	21	
6.5	6305	21.5	
7	6093	22	
7.5	5229	22.5	
8	4810	23	
8.5	4064	23.5	
9	3617	24	
9.5	2994	24.5	
10	3393	25	
10.5	4558	25.5	
11	4828	26	
11.5	4574	26.5	
12	4654	27	
12.5	4774	27.5	
13	4534	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 9, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,900

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-7

Maximum Depth 11 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3871	15.5	
1	3975	16	
1.5	4585	16.5	
2	4381	17	
2.5	4008	17.5	
3	3919	18	
3.5	3609	18.5	
4	3534	19	
4.5	3588	19.5	
5	3680	20	
5.5	3602	20.5	
6	4532	21	
6.5	5278	21.5	
7	5206	22	
7.5	5119	22.5	
8	4996	23	
8.5	4574	23.5	
9	4369	24	
9.5	3856	24.5	
10	3300	25	
10.5	2860	25.5	
11	2574	26	
11.5	2603	26.5	
11.8	2449	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 9, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,900

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-9

Maximum Depth 10 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2609	15.5	
1	3654	16	
1.5	3640	16.5	
2	3406	17	
2.5	3441	17.5	
3	3582	18	
3.5	4933	18.5	
4	8799	19	
4.5	7546	19.5	
5	6633	20	
5.5	5967	20.5	
6	5419	21	
6.5	4554	21.5	
7	3850	22	
7.5	3248	22.5	
8	3160	23	
8.5	3186	23.5	
9	3315	24	
9.5	2957	24.5	
10	2451	25	
10.3	2060	25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 9, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,900

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-10
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2470	15.5	
1	4244	16	
1.5	5737	16.5	
2	5880	17	
2.5	5586	17.5	
3	5670	18	
3.5	6133	18.5	
4	8526	19	
4.5	6031	19.5	
5	4321	20	
5.5	4151	20.5	
6	4074	21	
6.5	3972	21.5	
7	4014	22	
7.5	4023	22.5	
8	4295	23	
8.5	4284	23.5	
9	4386	24	
9.5	4109	24.5	
10	4090	25	
10.5	3808	25.5	
11	3793	26	
11.5	4162	26.5	
11.10	4200	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 9, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,900

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-11
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3230	15.5	
1	5291	16	
1.5	6039	16.5	
2	5944	17	
2.5	5732	17.5	
3	6529	18	
3.5	6840	18.5	
4	6591	19	
4.5	5940	19.5	
5	5274	20	
5.5	4159	20.5	
6	5211	21	
6.5	6663	21.5	
7	6548	22	
7.5	6624	22.5	
8	5881	23	
8.5	5077	23.5	
9	5217	24	
9.5	5619	24.5	
10	5396	25	
10.5	5986	25.5	
11	6399	26	
11.5	6721	26.5	
11.10	6579	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002 — Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 — Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 — Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-12
Maximum Depth 12 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4278	15.5	
1	5910	16	
1.5	6772	16.5	
2	7317	17	
2.5	7459	17.5	
3	8707	18	
3.5	7723	18.5	
4	6803	19	
4.5	5986	19.5	
5	5323	20	
5.5	4893	20.5	
6	4696	21	
6.5	5385	21.5	
7	5183	22	
7.5	4667	22.5	
8	4422	23	
8.5	4658	23.5	
9	4496	24	
9.5	4600	24.5	
10	4642	25	
10.5	4839	25.5	
11	5303	26	
11.5	6385	26.5	
12	7171	27	
12.5	8847	27.5	
12.9	8915	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-13
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4189	15.5	
1	5580	16	
1.5	6257	16.5	
2	6523	17	
2.5	6334	17.5	
3	8477	18	
3.5	8886	18.5	
4	7957	19	
4.5	6566	19.5	
5	5152	20	
5.5	5331	20.5	
6	6248	21	
6.5	6588	21.5	
7	6341	22	
7.5	6410	22.5	
8	6546	23	
8.5	6144	23.5	
9	5692	24	
9.5	5216	24.5	
10	5168	25	
10.5	5751	25.5	
11	5756	26	
11.5	6039	26.5	
12	6233	27	
12.5	6678	27.5	
13	6103	28	
13.5	5322	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-14
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4007	15.5	
1	5536	16	
1.5	5971	16.5	
2	5918	17	
2.5	5653	17.5	
3	6596	18	
3.5	7494	18.5	
4	6909	19	
4.5	5331	19.5	
5	5742	20	
5.5	6347	20.5	
6	6312	21	
6.5	4986	21.5	
7	4468	22	
7.5	4229	22.5	
8	5406	23	
8.5	7793	23.5	
9	8425	24	
9.5	6458	24.5	
10	6274	25	
10.5	7377	25.5	
11	7519	26	
11.5	7433	26.5	
12	6403	27	
12.5	4902	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-15
Maximum Depth 12 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3637	15.5	
1	5068	16	
1.5	6168	16.5	
2	6299	17	
2.5	6292	17.5	
3	6902	18	
3.5	6805	18.5	
4	7161	19	
4.5	7454	19.5	
5	7612	20	
5.5	7513	20.5	
6	6354	21	
6.5	5702	21.5	
7	6079	22	
7.5	5719	22.5	
8	5222	23	
8.5	5136	23.5	
9	4389	24	
9.5	3491	24.5	
10	2934	25	
10.5	3231	25.5	
11	4348	26	
11.5	5772	26.5	
12	6841	27	
12.5	6505	27.5	
12.9	5889	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-16
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3231	15.5	
1	4651	16	
1.5	4489	16.5	
2	3862	17	
2.5	3921	17.5	
3	4271	18	
3.5	5509	18.5	
4	6037	19	
4.5	5305	19.5	
5	5573	20	
5.5	5111	20.5	
6	5172	21	
6.5	4971	21.5	
7	5109	22	
7.5	5049	22.5	
8	5418	23	
8.5	5666	23.5	
9	6012	24	
9.5	6473	24.5	
10	7830	25	
10.5	7704	25.5	
11	6759	26	
11.5	6122	26.5	
12	5602	27	
12.5	5502	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: C-17
Maximum Depth 12 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2756	15.5	
1	4089	16	
1.5	6119	16.5	
2	6875	17	
2.5	5060	17.5	
3	3712	18	
3.5	4604	18.5	
4	4983	19	
4.5	4736	19.5	
5	4673	20	
5.5	4679	20.5	
6	5089	21	
6.5	5202	21.5	
7	5014	22	
7.5	5490	22.5	
8	5427	23	
8.5	5614	23.5	
9	6906	24	
9.5	5929	24.5	
10	4398	25	
10.5	5168	25.5	
11	5909	26	
11.5	5813	26.5	
12	5522	27	
12.3	5646	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-1
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3560	15.5	
1	3247	16	
1.5	3345	16.5	
2	2590	17	
2.5	2319	17.5	
3	2850	18	
3.5	3462	18.5	
4	3316	19	
4.5	3514	19.5	
5	4876	20	
5.5	4359	20.5	
6	3925	21	
6.5	3169	21.5	
7	2936	22	
7.5	2846	22.5	
8	2832	23	
8.5	2762	23.5	
9	2572	24	
9.5	2328	24.5	
10	2582	25	
10.5	3247	25.5	
11	3597	26	
11.5	4538	26.5	
11.10	5247	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-2

Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3356	15.5	
1	3363	16	
1.5	2858	16.5	
2	2009	17	
2.5	2706	17.5	
3	4531	18	
3.5	5406	18.5	
4	5425	19	
4.5	5408	19.5	
5	5900	20	
5.5	6042	20.5	
6	5956	21	
6.5	5366	21.5	
7	6524	22	
7.5	6634	22.5	
8	6866	23	
8.5	7931	23.5	
9	7312	24	
9.5	6925	24.5	
10	7678	25	
10.5	8104	25.5	
11	7940	26	
11.5	7605	26.5	
11.10	7022	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-3
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3648	15.5	
1	4214	16	
1.5	4437	16.5	
2	3883	17	
2.5	3478	17.5	
3	3379	18	
3.5	4003	18.5	
4	4884	19	
4.5	5405	19.5	
5	5737	20	
5.5	5243	20.5	
6	5071	21	
6.5	5451	21.5	
7	4836	22	
7.5	3462	22.5	
8	4500	23	
8.5	4490	23.5	
9	4450	24	
9.5	4037	24.5	
10	3812	25	
10.5	3938	25.5	
11	4229	26	
11.5	4413	26.5	
11.10	4264	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-4
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3210	15.5	
1	3432	16	
1.5	3752	16.5	
2	3122	17	
2.5	3920	17.5	
3	7029	18	
3.5	7823	18.5	
4	8462	19	
4.5	8020	19.5	
5	7827	20	
5.5	6844	20.5	
6	5393	21	
6.5	3802	21.5	
7	3400	22	
7.5	3493	22.5	
8	3684	23	
8.5	4018	23.5	
9	4982	24	
9.5	6222	24.5	
10	6592	25	
10.5	5702	25.5	
11	5353	26	
11.5	6072	26.5	
12	7531	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-5
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3320	15.5	
1	3923	16	
1.5	5301	16.5	
2	4099	17	
2.5	3303	17.5	
3	3762	18	
3.5	3823	18.5	
4	3852	19	
4.5	3947	19.5	
5	4006	20	
5.5	4030	20.5	
6	4048	21	
6.5	3994	21.5	
7	3878	22	
7.5	3421	22.5	
8	3659	23	
8.5	3799	23.5	
9	3627	24	
9.5	3559	24.5	
10	3313	25	
10.5	2930	25.5	
11	3445	26	
11.5	3600	26.5	
12	3299	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-6

Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3649	15.5	
1	3975	16	
1.5	4792	16.5	
2	6878	17	
2.5	7320	17.5	
3	5408	18	
3.5	5160	18.5	
4	5045	19	
4.5	4882	19.5	
5	5349	20	
5.5	5606	20.5	
6	6271	21	
6.5	5982	21.5	
7	6062	22	
7.5	6532	22.5	
8	7380	23	
8.5	7843	23.5	
9	8244	24	
9.5	8238	24.5	
10	8005	25	
10.5	7370	25.5	
11	6783	26	
11.5	6697	26.5	
12	6302	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm =
18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-7
Maximum Depth 12 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3873	15.5	
1	4587	16	
1.5	4204	16.5	
2	3395	17	
2.5	3876	17.5	
3	6068	18	
3.5	6524	18.5	
4	5221	19	
4.5	6154	19.5	
5	6120	20	
5.5	6146	20.5	
6	5423	21	
6.5	4727	21.5	
7	4497	22	
7.5	4451	22.5	
8	4640	23	
8.5	4752	23.5	
9	4930	24	
9.5	4868	24.5	
10	4802	25	
10.5	4640	25.5	
11	4505	26	
11.5	4417	26.5	
12	4400	27	
12.2	4430	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-8
Maximum Depth 12 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3330	15.5	
1	3723	16	
1.5	3782	16.5	
2	3954	17	
2.5	3778	17.5	
3	3535	18	
3.5	3939	18.5	
4	4262	19	
4.5	4682	19.5	
5	5310	20	
5.5	5387	20.5	
6	5353	21	
6.5	5158	21.5	
7	5017	22	
7.5	5003	22.5	
8	4944	23	
8.5	4908	23.5	
9	5938	24	
9.5	6323	24.5	
10	6326	25	
10.5	6334	25.5	
11	7231	26	
11.5	7566	26.5	
12	7470	27	
12.4	7037	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002
Technician: Toby Shewan
Instrument Model No.: Ludlum 2221
Operational Check: 20, 004
Serial No: 132844
Probe Model No.: PR 44-10
Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.
* Shielded (2")

Boring No.: D-9
Maximum Depth 11 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3029	15.5	
1	3435	16	
1.5	3475	16.5	
2	3639	17	
2.5	3665	17.5	
3	3968	18	
3.5	4083	18.5	
4	4347	19	
4.5	4888	19.5	
5	5286	20	
5.5	5700	20.5	
6	5559	21	
6.5	5594	21.5	
7	5352	22	
7.5	5195	22.5	
8	5155	23	
8.5	5896	23.5	
9	6135	24	
9.5	6611	24.5	
10	6385	25	
10.5	6133	25.5	
11	6454	26	
11.3	6253	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-10
Maximum Depth 11 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4171	15.5	
1	4561	16	
1.5	5308	16.5	
2	6816	17	
2.5	7147	17.5	
3	7139	18	
3.5	7531	18.5	
4	13,159	19	
4.5	40,657	19.5	
5	115,880	20	
5.5	42,155	20.5	
6	18,663	21	
6.5	11,641	21.5	
7	8982	22	
7.5	8037	22.5	
8	8160	23	
8.5	8337	23.5	
9	8279	24	
9.5	7616	24.5	
10	6765	25	
10.5	6827	25.5	
11	8009	26	
11.5	7973	26.5	
11.8	7905	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-10 A
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3325	15.5	
1	4009	16	
1.5	3908	16.5	
2	2810	17	
2.5	3142	17.5	
3	4562	18	
3.5	4332	18.5	
4	4435	19	
4.5	4640	19.5	
5	4951	20	
5.5	4975	20.5	
6	4775	21	
6.5	5210	21.5	
7	6011	22	
7.5	5904	22.5	
8	6381	23	
8.5	6267	23.5	
9	6671	24	
9.5	6751	24.5	
10	7392	25	
10.5	8279	25.5	
11	7582	26	
11.5	7000	26.5	
12	7088	27	
12.5	7265	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-10 B
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3474	15.5	
1	4879	16	
1.5	5064	16.5	
2	3241	17	
2.5	2832	17.5	
3	4379	18	
3.5	5838	18.5	
4	5564	19	
4.5	5136	19.5	
5	4563	20	
5.5	4421	20.5	
6	4756	21	
6.5	5153	21.5	
7	3682	22	
7.5	3570	22.5	
8	3911	23	
8.5	4774	23.5	
9	5115	24	
9.5	4882	24.5	
10	4732	25	
10.5	4891	25.5	
11	4418	26	
11.5	4402	26.5	
12	3937	27	
12.5	3451	27.5	
13	3582	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-10 C
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4399	15.5	
1	4010	16	
1.5	4180	16.5	
2	4637	17	
2.5	4739	17.5	
3	5288	18	
3.5	4854	18.5	
4	5191	19	
4.5	6877	19.5	
5	7879	20	
5.5	6873	20.5	
6	6312	21	
6.5	6314	21.5	
7	5819	22	
7.5	5790	22.5	
8	5289	23	
8.5	5307	23.5	
9	5732	24	
9.5	7052	24.5	
10	8122	25	
10.5	8034	25.5	
11	7161	26	
11.5	7455	26.5	
12	7963	27	
12.5	8236	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-11
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3221	15.5	
1	4315	16	
1.5	5109	16.5	
2	5132	17	
2.5	5639	17.5	
3	6240	18	
3.5	6376	18.5	
4	6234	19	
4.5	5495	19.5	
5	6032	20	
5.5	5730	20.5	
6	5560	21	
6.5	6080	21.5	
7	6477	22	
7.5	6726	22.5	
8	6668	23	
8.5	5817	23.5	
9	5668	24	
9.5	5112	24.5	
10	4706	25	
10.5	4198	25.5	
11	3988	26	
11.5	3895	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-12
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4873	15.5	
1	5518	16	
1.5	5749	16.5	
2	6551	17	
2.5	7439	17.5	
3	6789	18	
3.5	5252	18.5	
4	2572	19	
4.5	2907	19.5	
5	5214	20	
5.5	5243	20.5	
6	4839	21	
6.5	4929	21.5	
7	4348	22	
7.5	5339	22.5	
8	5873	23	
8.5	7527	23.5	
9	9272	24	
9.5	9425	24.5	
10	9618	25	
10.5	9335	25.5	
11	8848	26	
11.5	9302	26.5	
11.10	9460	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-13
Maximum Depth 11 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3681	15.5	
1	4622	16	
1.5	4715	16.5	
2	5161	17	
2.5	5016	17.5	
3	4999	18	
3.5	3066	18.5	
4	3831	19	
4.5	5239	19.5	
5	6238	20	
5.5	6916	20.5	
6	6486	21	
6.5	6705	21.5	
7	6146	22	
7.5	5614	22.5	
8	5121	23	
8.5	4825	23.5	
9	4479	24	
9.5	4823	24.5	
10	5155	25	
10.5	4935	25.5	
11	4585	26	
11.3	4375	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-14

Maximum Depth 12 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4241	15.5	
1	5068	16	
1.5	5355	16.5	
2	5721	17	
2.5	6088	17.5	
3	7185	18	
3.5	5925	18.5	
4	5656	19	
4.5	5462	19.5	
5	5012	20	
5.5	6540	20.5	
6	7132	21	
6.5	7672	21.5	
7	7120	22	
7.5	6678	22.5	
8	6478	23	
8.5	7031	23.5	
9	6989	24	
9.5	6730	24.5	
10	6285	25	
10.5	5874	25.5	
11	5911	26	
11.5	5959	26.5	
12	6023	27	
12.4	6170	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-15

Maximum Depth 12 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4154	15.5	
1	5017	16	
1.5	5118	16.5	
2	5163	17	
2.5	4778	17.5	
3	4644	18	
3.5	4431	18.5	
4	4704	19	
4.5	4517	19.5	
5	5159	20	
5.5	5598	20.5	
6	4970	21	
6.5	4900	21.5	
7	4340	22	
7.5	3536	22.5	
8	4687	23	
8.5	5877	23.5	
9	6300	24	
9.5	6934	24.5	
10	7485	25	
10.5	8182	25.5	
11	7235	26	
11.5	5427	26.5	
12	4898	27	
12.5	5449	27.5	
12.9	5893	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-16

Maximum Depth 11 feet 7 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4490	15.5	
1	5407	16	
1.5	5336	16.5	
2	4907	17	
2.5	4984	17.5	
3	3568	18	
3.5	2628	18.5	
4	5383	19	
4.5	5964	19.5	
5	5176	20	
5.5	5559	20.5	
6	6763	21	
6.5	6873	21.5	
7	5697	22	
7.5	4819	22.5	
8	4787	23	
8.5	5489	23.5	
9	6143	24	
9.5	5778	24.5	
10	4893	25	
10.5	4342	25.5	
11	4271	26	
11.5	3969	26.5	
11.7	3912	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
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Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-17
Maximum Depth 11 feet 7 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3796	15.5	
1	4836	16	
1.5	4868	16.5	
2	4201	17	
2.5	4431	17.5	
3	4955	18	
3.5	4786	18.5	
4	422	19	
4.5	5209	19.5	
5	5647	20	
5.5	4456	20.5	
6	3931	21	
6.5	4314	21.5	
7	3885	22	
7.5	4117	22.5	
8	3845	23	
8.5	3588	23.5	
9	3100	24	
9.5	2856	24.5	
10	3117	25	
10.5	3736	25.5	
11	3869	26	
11.5	3695	26.5	
11.7	3675	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
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Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-18
Maximum Depth 11 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4108	15.5	
1	4986	16	
1.5	5555	16.5	
2	5978	17	
2.5	6327	17.5	
3	5741	18	
3.5	4045	18.5	
4	3524	19	
4.5	3909	19.5	
5	3793	20	
5.5	3453	20.5	
6	3624	21	
6.5	5738	21.5	
7	6832	22	
7.5	6120	22.5	
8	5385	23	
8.5	5150	23.5	
9	5277	24	
9.5	5588	24.5	
10	5872	25	
10.5	6204	25.5	
11	5119	26	
11.5	4460	26.5	
11.11	4285	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-19
Maximum Depth 11 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4369	15.5	
1	5606	16	
1.5	5763	16.5	
2	5386	17	
2.5	5641	17.5	
3	4753	18	
3.5	4536	18.5	
4	4736	19	
4.5	3432	19.5	
5	2061	20	
5.5	3861	20.5	
6	5647	21	
6.5	5606	21.5	
7	5254	22	
7.5	5432	22.5	
8	5909	23	
8.5	5308	23.5	
9	5021	24	
9.5	4997	24.5	
10	4969	25	
10.5	4759	25.5	
11	5423	26	
11.5	5406	26.5	
11.9	5328	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-20
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4130	15.5	
1	4818	16	
1.5	4891	16.5	
2	4977	17	
2.5	4832	17.5	
3	5294	18	
3.5	5158	18.5	
4	5754	19	
4.5	4950	19.5	
5	3909	20	
5.5	3397	20.5	
6	2799	21	
6.5	2284	21.5	
7	2473	22	
7.5	2253	22.5	
8	2311	23	
8.5	2278	23.5	
9	2207	24	
9.5	2152	24.5	
10	2133	25	
10.5	2090	25.5	
11	2045	26	
11.5	2300	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
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Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-21
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3999	15.5	
1	4947	16	
1.5	4813	16.5	
2	3092	17	
2.5	2101	17.5	
3	4291	18	
3.5	7833	18.5	
4	6839	19	
4.5	5626	19.5	
5	5429	20	
5.5	5939	20.5	
6	6425	21	
6.5	6206	21.5	
7	5482	22	
7.5	5854	22.5	
8	66979	23	
8.5	7334	23.5	
9	6340	24	
9.5	5152	24.5	
10	5572	25	
10.5	3943	25.5	
11	3962	26	
11.5	4192	26.5	
12	5254	27	
12.5	6446	27.5	
13	6688	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-22
Maximum Depth 9 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5006	15.5	
1	5957	16	
1.5	6015	16.5	
2	6228	17	
2.5	5808	17.5	
3	5234	18	
3.5	5768	18.5	
4	6314	19	
4.5	6321	19.5	
5	6453	20	
5.5	6659	20.5	
6	7229	21	
6.5	7449	21.5	
7	7000	22	
7.5	6088	22.5	
8	5146	23	
8.5	4904	23.5	
9	6084	24	
9.4 obstructed	6413	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
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Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm =

18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-23

Maximum Depth 12 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5029	15.5	
1	6088	16	
1.5	6887	16.5	
2	3813	17	
2.5	2207	17.5	
3	3652	18	
3.5	5325	18.5	
4	4844	19	
4.5	4591	19.5	
5	5581	20	
5.5	5162	20.5	
6	4526	21	
6.5	4617	21.5	
7	4380	22	
7.5	4107	22.5	
8	4170	23	
8.5	4945	23.5	
9	6134	24	
9.5	8127	24.5	
10	8734	25	
10.5	8432	25.5	
11	7389	26	
11.5	5755	26.5	
12	4683	27	
12.2	4473	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-24
Maximum Depth 11 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4492	15.5	
1	5822	16	
1.5	5313	16.5	
2	4449	17	
2.5	2351	17.5	
3	3959	18	
3.5	5654	18.5	
4	6556	19	
4.5	6352	19.5	
5	6216	20	
5.5	5624	20.5	
6	5016	21	
6.5	4281	21.5	
7	4338	22	
7.5	4238	22.5	
8	3885	23	
8.5	4079	23.5	
9	4594	24	
9.5	4015	24.5	
10	3801	25	
10.5	4171	25.5	
11	5990	26	
11.5	7825	26.5	
11.11	8228	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
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Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-25
Maximum Depth 11 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3353	15.5	
1	5578	16	
1.5	7766	16.5	
2	7628	17	
2.5	6145	17.5	
3	3898	18	
3.5	2150	18.5	
4	3834	19	
4.5	4925	19.5	
5	4157	20	
5.5	4137	20.5	
6	3951	21	
6.5	4479	21.5	
7	4930	22	
7.5	5043	22.5	
8	5054	23	
8.5	4762	23.5	
9	4862	24	
9.5	5491	24.5	
10	5648	25	
10.5	5621	25.5	
11	5563	26	
11.4	5493	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
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Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-26
Maximum Depth 12 feet 7 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5549	15.5	
1	6711	16	
1.5	6325	16.5	
2	6178	17	
2.5	5593	17.5	
3	5962	18	
3.5	5964	18.5	
4	5862	19	
4.5	5952	19.5	
5	5548	20	
5.5	3728	20.5	
6	2093	21	
6.5	1962	21.5	
7	4083	22	
7.5	5205	22.5	
8	5285	23	
8.5	5399	23.5	
9	5304	24	
9.5	6604	24.5	
10	7315	25	
10.5	6694	25.5	
11	6588	26	
11.4	6125	26.5	
12	5701	27	
12.5	5342	27.5	
12.7	5273	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
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Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-27

Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4450	15.5	
1	6045	16	
1.5	6222	16.5	
2	6122	17	
2.5	5688	17.5	
3	3279	18	
3.5	2020	18.5	
4	3101	19	
4.5	3617	19.5	
5	4577	20	
5.5	4765	20.5	
6	6103	21	
6.5	7877	21.5	
7	8003	22	
7.5	6625	22.5	
8	5146	23	
8.5	4771	23.5	
9	4030	24	
9.5	4076	24.5	
10	3970	25	
10.5	3662	25.5	
11	3219	26	
11.4	2893	26.5	
12	2567	27	
12.5	3103	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
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Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-28

Maximum Depth 11 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4228	15.5	
1	4840	16	
1.5	2861	16.5	
2	2092	17	
2.5	4937	17.5	
3	5523	18	
3.5	6143	18.5	
4	5376	19	
4.5	5851	19.5	
5	6984	20	
5.5	7202	20.5	
6	6516	21	
6.5	5106	21.5	
7	4563	22	
7.5	4635	22.5	
8	5670	23	
8.5	5619	23.5	
9	4997	24	
9.5	4779	24.5	
10	5413	25	
10.5	5673	25.5	
11	6808	26	
11.4	7597	26.5	
11.11	7477	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

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Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-29

Maximum Depth 12 feet 1 inch

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4099	15.5	
1	5152	16	
1.5	5748	16.5	
2	5349	17	
2.5	5266	17.5	
3	5393	18	
3.5	4211	18.5	
4	3312	19	
4.5	3811	19.5	
5	6130	20	
5.5	5661	20.5	
6	6412	21	
6.5	6380	21.5	
7	5718	22	
7.5	6042	22.5	
8	6115	23	
8.5	7657	23.5	
9	7945	24	
9.5	6309	24.5	
10	8208	25	
10.5	8531	25.5	
11	5757	26	
11.4	7058	26.5	
12	8718	27	
12.1	7792	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-30

Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4537	15.5	
1	4554	16	
1.5	4934	16.5	
2	4950	17	
2.5	4251	17.5	
3	4240	18	
3.5	5182	18.5	
4	4223	19	
4.5	4735	19.5	
5	5114	20	
5.5	5377	20.5	
6	5329	21	
6.5	5872	21.5	
7	6918	22	
7.5	6267	22.5	
8	5713	23	
8.5	6734	23.5	
9	6784	24	
9.5	7166	24.5	
10	6265	25	
10.5	4952	25.5	
11	4720	26	
11.4	4900	26.5	
12	6347	27	
12.5	7787	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-31
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3367	15.5	
1	4253	16	
1.5	4602	16.5	
2	4432	17	
2.5	4372	17.5	
3	4525	18	
3.5	4262	18.5	
4	4240	19	
4.5	4425	19.5	
5	4067	20	
5.5	3900	20.5	
6	3799	21	
6.5	3786	21.5	
7	3911	22	
7.5	3935	22.5	
8	3887	23	
8.5	3671	23.5	
9	3409	24	
9.5	2883	24.5	
10	2442	25	
10.5	2555	25.5	
11	3074	26	
11.5	3205	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-32
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2686	15.5	
1	2848	16	
1.5	2890	16.5	
2	2927	17	
2.5	2930	17.5	
3	3438	18	
3.5	3569	18.5	
4	3729	19	
4.5	3744	19.5	
5	3802	20	
5.5	3820	20.5	
6	3720	21	
6.5	3604	21.5	
7	3279	22	
7.5	2971	22.5	
8	3403	23	
8.5	3643	23.5	
9	3903	24	
9.5	5943	24.5	
10	7300	25	
10.5	7107	25.5	
11	6901	26	
11.5	6747	26.5	
12	7153	27	
12.5	7227	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-33
Maximum Depth 10 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2350	15.5	
1	2501	16	
1.5	2518	16.5	
2	2459	17	
2.5	2745	17.5	
3	2458	18	
3.5	2155	18.5	
4	1927	19	
4.5	2147	19.5	
5	2225	20	
5.5	2459	20.5	
6	2417	21	
6.5	2361	21.5	
7	2048	22	
7.5	2014	22.5	
8	1957	23	
8.5	1917	23.5	
9	1880	24	
9.5	1868	24.5	
10	1883	25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-34
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2855	15.5	
1	2990	16	
1.5	2655	16.5	
2	2723	17	
2.5	3183	17.5	
3	2891	18	
3.5	3013	18.5	
4	3949	19	
4.5	6399	19.5	
5	17,426	20	
5.5	50,141	20.5	
6	108,780	21	
6.5	37,769	21.5	
7	11,008	22	
7.5	6085	22.5	
8	5264	23	
8.5	5031	23.5	
9	6260	24	
9.5	5640	24.5	
10	5514	25	
10.5	5521	25.5	
11	5625	26	
11.5	5828	26.5	
12	5724	27	
12.5	6468	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-34 A
Maximum Depth 12 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3893	15.5	
1	3788	16	
1.5	3478	16.5	
2	2930	17	
2.5	2253	17.5	
3	2514	18	
3.5	3761	18.5	
4	4291	19	
4.5	4848	19.5	
5	5710	20	
5.5	5887	20.5	
6	6125	21	
6.5	6188	21.5	
7	6072	22	
7.5	6354	22.5	
8	6428	23	
8.5	6339	23.5	
9	5004	24	
9.5	4032	24.5	
10	4693	25	
10.5	5654	25.5	
11	7036	26	
11.5	8171	26.5	
12	8378	27	
12.5	7828	27.5	
12.9	7483	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-34 B
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3599	15.5	
1	3207	16	
1.5	2627	16.5	
2	2559	17	
2.5	2730	17.5	
3	2978	18	
3.5	3913	18.5	
4	5492	19	
4.5	5674	19.5	
5	5360	20	
5.5	4937	20.5	
6	5458	21	
6.5	5545	21.5	
7	5116	22	
7.5	4338	22.5	
8	4085	23	
8.5	5023	23.5	
9	7742	24	
9.5	8283	24.5	
10	8579	25	
10.5	8730	25.5	
11	8576	26	
11.5	7995	26.5	
11.10	7253	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-34 C
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2828	15.5	
1	2605	16	
1.5	2407	16.5	
2	2945	17	
2.5	4037	17.5	
3	4192	18	
3.5	4906	18.5	
4	6101	19	
4.5	6338	19.5	
5	6703	20	
5.5	7575	20.5	
6	6911	21	
6.5	6270	21.5	
7	4543	22	
7.5	3856	22.5	
8	5278	23	
8.5	5154	23.5	
9	5369	24	
9.5	6842	24.5	
10	6819	25	
10.5	6453	25.5	
11	5965	26	
11.5	5814	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002 | Technician: J. Farrens

Instrument Model No.: Ludlum 2221 | Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 | Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-35
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3647	15.5	
1	3540	16	
1.5	2966	16.5	
2	1894	17	
2.5	2482	17.5	
3	3988	18	
3.5	3936	18.5	
4	4929	19	
4.5	5725	19.5	
5	5162	20	
5.5	4515	20.5	
6	4476	21	
6.5	4506	21.5	
7	4725	22	
7.5	4401	22.5	
8	4374	23	
8.5	4356	23.5	
9	4169	24	
9.5	4553	24.5	
10	4446	25	
10.5	3990	25.5	
11	3866	26	
11.5	4012	26.5	
12	5083	27	
12.5	6666	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-36
Maximum Depth 10 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3444	15.5	
1	4630	16	
1.5	3861	16.5	
2	2481	17	
2.5	1638	17.5	
3	3844	18	
3.5	6966	18.5	
4	5659	19	
4.5	4307	19.5	
5	4113	20	
5.5	4305	20.5	
6	4470	21	
6.5	4444	21.5	
7	4146	22	
7.5	3695	22.5	
8	4635	23	
8.5	4940	23.5	
9	5370	24	
9.5	5120	24.5	
10	4756	25	
10.5	5028	25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: J. Ferrans

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-37
Maximum Depth 9 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3821	15.5	
1	3614	16	
1.5	3512	16.5	
2	3683	17	
2.5	3361	17.5	
3	3008	18	
3.5	2743	18.5	
4	2616	19	
4.5	2905	19.5	
5	4848	20	
5.5	7902	20.5	
6	8687	21	
6.5	8208	21.5	
7	7111	22	
7.5	6260	22.5	
8	8965	23	
8.5	8523	23.5	
9	7077	24	
9.5	5466	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-37
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2893	15.5	
1	3556	16	
1.5	3741	16.5	
2	4908	17	
2.5	6789	17.5	
3	6228	18	
3.5	5146	18.5	
4	4533	19	
4.5	4498	19.5	
5	5325	20	
5.5	5661	20.5	
6	5678	21	
6.5	5146	21.5	
7	4250	22	
7.5	3997	22.5	
8	5193	23	
8.5	4991	23.5	
9	5284	24	
9.5	5399	24.5	
10	5331	25	
10.5	4769	25.5	
11	4589	26	
11.5	4575	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-38
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3385	15.5	
1	4641	16	
1.5	4728	16.5	
2	4512	17	
2.5	4963	17.5	
3	4665	18	
3.5	5202	18.5	
4	4847	19	
4.5	4757	19.5	
5	6010	20	
5.5	5798	20.5	
6	5134	21	
6.5	4716	21.5	
7	4943	22	
7.5	5169	22.5	
8	5741	23	
8.5	5099	23.5	
9	4275	24	
9.5	4270	24.5	
10	4434	25	
10.5	4006	25.5	
11	4064	26	
11.5	3650	26.5	
12	3551	27	
12.5	3944	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-39
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4041	15.5	
1	5435	16	
1.5	6541	16.5	
2	6740	17	
2.5	7090	17.5	
3	7090	18	
3.5	6449	18.5	
4	4743	19	
4.5	5878	19.5	
5	5515	20	
5.5	3811	20.5	
6	2949	21	
6.5	3179	21.5	
7	3786	22	
7.5	4053	22.5	
8	5051	23	
8.5	7237	23.5	
9	8371	24	
9.5	7981	24.5	
10	7564	25	
10.5	7797	25.5	
11	7832	26	
11.5	7537	26.5	
12	8071	27	
12.5	8458	27.5	
13	8689	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 10, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20, 004

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-40

Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4288	15.5	
1	5419	16	
1.5	5444	16.5	
2	5249	17	
2.5	5472	17.5	
3	5231	18	
3.5	5280	18.5	
4	5050	19	
4.5	5136	19.5	
5	6247	20	
5.5	6455	20.5	
6	5976	21	
6.5	6752	21.5	
7	6924	22	
7.5	6538	22.5	
8	5241	23	
8.5	4591	23.5	
9	4007	24	
9.5	4270	24.5	
10	4544	25	
10.5	4481	25.5	
11	4727	26	
11.5	4961	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-41
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2616	15.5	
1	4789	16	
1.5	4903	16.5	
2	4940	17	
2.5	5055	17.5	
3	5599	18	
3.5	5547	18.5	
4	4918	19	
4.5	4257	19.5	
5	4618	20	
5.5	5814	20.5	
6	5860	21	
6.5	4751	21.5	
7	4149	22	
7.5	4293	22.5	
8	4566	23	
8.5	5136	23.5	
9	4932	24	
9.5	5375	24.5	
10	5897	25	
10.5	5966	25.5	
11	5491	26	
11.5	5118	26.5	
12	5220	27	
12.5	6010	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-42
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3702	15.5	
1	4515	16	
1.5	4283	16.5	
2	4098	17	
2.5	5265	17.5	
3	5616	18	
3.5	5061	18.5	
4	4931	19	
4.5	4797	19.5	
5	4995	20	
5.5	5531	20.5	
6	6532	21	
6.5	7109	21.5	
7	6048	22	
7.5	4158	22.5	
8	3733	23	
8.5	4176	23.5	
9	3867	24	
9.5	3685	24.5	
10	4006	25	
10.5	4361	25.5	
11	4849	26	
11.5	5927	26.5	
12	6452	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-43
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3605	15.5	
1	4406	16	
1.5	4804	16.5	
2	4931	17	
2.5	5338	17.5	
3	5516	18	
3.5	5817	18.5	
4	5340	19	
4.5	4691	19.5	
5	4244	20	
5.5	5490	20.5	
6	5102	21	
6.5	4122	21.5	
7	3907	22	
7.5	3278	22.5	
8	3082	23	
8.5	2738	23.5	
9	2674	24	
9.5	3474	24.5	
10	3981	25	
10.5	4298	25.5	
11	4175	26	
11.5	3839	26.5	
12	4122	27	
12.5	4637	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-44
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3862	15.5	
1	4905	16	
1.5	5494	16.5	
2	5372	17	
2.5	4075	17.5	
3	3584	18	
3.5	3933	18.5	
4	4787	19	
4.5	4896	19.5	
5	5065	20	
5.5	5185	20.5	
6	5633	21	
6.5	5701	21.5	
7	5407	22	
7.5	4629	22.5	
8	4449	23	
8.5	4711	23.5	
9	6092	24	
9.5	7140	24.5	
10	7206	25	
10.5	7734	25.5	
11	7723	26	
11.5	7358	26.5	
12	6637	27	
12.5	4567	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-45
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3937	15.5	
1	6203	16	
1.5	5874	16.5	
2	3624	17	
2.5	3578	17.5	
3	4454	18	
3.5	5363	18.5	
4	5642	19	
4.5	6370	19.5	
5	6461	20	
5.5	5529	20.5	
6	4739	21	
6.5	6114	21.5	
7	8258	22	
7.5	8674	22.5	
8	8692	23	
8.5	8739	23.5	
9	8175	24	
9.5	7964	24.5	
10	7179	25	
10.5	5191	25.5	
11	4457	26	
11.5	4217	26.5	
12	4934	27	
12.5	5991	27.5	
13	6151	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-46
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2634	15.5	
1	4159	16	
1.5	5133	16.5	
2	5698	17	
2.5	5791	17.5	
3	5763	18	
3.5	5667	18.5	
4	5700	19	
4.5	5447	19.5	
5	5853	20	
5.5	5628	20.5	
6	4087	21	
6.5	3356	21.5	
7	4839	22	
7.5	5311	22.5	
8	4516	23	
8.5	5484	23.5	
9	5608	24	
9.5	5372	24.5	
10	5215	25	
10.5	4548	25.5	
11	3966	26	
11.5	3554	26.5	
12	3893	27	
12.5	3907	27.5	
13	3778	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-47
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4597	15.5	
1	6120	16	
1.5	6831	16.5	
2	5412	17	
2.5	3198	17.5	
3	2886	18	
3.5	4291	18.5	
4	4188	19	
4.5	5013	19.5	
5	4980	20	
5.5	4876	20.5	
6	5194	21	
6.5	7890	21.5	
7	9544	22	
7.5	9744	22.5	
8	9217	23	
8.5	7630	23.5	
9	6398	24	
9.5	4719	24.5	
10	4160	25	
10.5	4410	25.5	
11	4390	26	
11.5	3910	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-48
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2692	15.5	
1	2594	16	
1.5	3384	16.5	
2	4403	17	
2.5	4866	17.5	
3	5537	18	
3.5	6114	18.5	
4	7465	19	
4.5	8480	19.5	
5	9311	20	
5.5	6879	20.5	
6	5758	21	
6.5	5289	21.5	
7	4662	22	
7.5	4058	22.5	
8	3931	23	
8.5	4464	23.5	
9	4167	24	
9.5	5697	24.5	
10	7432	25	
10.5	8316	25.5	
11	7382	26	
11.5	5627	26.5	
12	5972	27	
12.5	8167	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-49
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3891	15.5	
1	4696	16	
1.5	3400	16.5	
2	3048	17	
2.5	3412	17.5	
3	4032	18	
3.5	4944	18.5	
4	5056	19	
4.5	4846	19.5	
5	4812	20	
5.5	4974	20.5	
6	6164	21	
6.5	7539	21.5	
7	7532	22	
7.5	7435	22.5	
8	7993	23	
8.5	7613	23.5	
9	7040	24	
9.5	5690	24.5	
10	5600	25	
10.5	5812	25.5	
11	6880	26	
11.5	5585	26.5	
12	4801	27	
12.5	4563	27.5	
13	4663	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-50
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2546	15.5	
1	4110	16	
1.5	4849	16.5	
2	4547	17	
2.5	4806	17.5	
3	4659	18	
3.5	3304	18.5	
4	3618	19	
4.5	4813	19.5	
5	6051	20	
5.5	5519	20.5	
6	4700	21	
6.5	4083	21.5	
7	3874	22	
7.5	3683	22.5	
8	4009	23	
8.5	4066	23.5	
9	4443	24	
9.5	4514	24.5	
10	4693	25	
10.5	4595	25.5	
11	4355	26	
11.5	4069	26.5	
12	3425	27	
12.5	3247	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-51
Maximum Depth 11feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3684	15.5	
1	5034	16	
1.5	5636	16.5	
2	6037	17	
2.5	5791	17.5	
3	5503	18	
3.5	5433	18.5	
4	4279	19	
4.5	2451	19.5	
5	2788	20	
5.5	5027	20.5	
6	5339	21	
6.5	4627	21.5	
7	4724	22	
7.5	5034	22.5	
8	5904	23	
8.5	6110	23.5	
9	5990	24	
9.5	5702	24.5	
10	5070	25	
10.5	4185	25.5	
11	4108	26	
11.5	3114	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-52

Maximum Depth 12 feet 1 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4677	15.5	
1	7198	16	
1.5	7078	16.5	
2	5984	17	
2.5	5923	17.5	
3	5947	18	
3.5	6102	18.5	
4	6019	19	
4.5	5444	19.5	
5	4259	20	
5.5	4006	20.5	
6	3937	21	
6.5	4027	21.5	
7	4934	22	
7.5	4727	22.5	
8	3984	23	
8.5	3835	23.5	
9	3395	24	
9.5	3303	24.5	
10	3155	25	
10.5	2981	25.5	
11	3142	26	
11.5	3406	26.5	
12	3596	27	
12.1	3601	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-53
Maximum Depth 13feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4065	15.5	
1	5291	16	
1.5	5469	16.5	
2	5145	17	
2.5	4691	17.5	
3	4578	18	
3.5	4417	18.5	
4	3775	19	
4.5	2711	19.5	
5	2471	20	
5.5	2623	20.5	
6	4121	21	
6.5	6268	21.5	
7	7975	22	
7.5	7406	22.5	
8	6639	23	
8.5	6774	23.5	
9	7641	24	
9.5	7226	24.5	
10	6104	25	
10.5	4291	25.5	
11	3787	26	
11.5	3660	26.5	
12	3982	27	
12.5	4170	27.5	
13	4911	28	
13.5	6130	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-54
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4519	15.5	
1	5563	16	
1.5	5960	16.5	
2	5970	17	
2.5	6041	17.5	
3	6268	18	
3.5	6132	18.5	
4	4659	19	
4.5	3068	19.5	
5	4043	20	
5.5	5540	20.5	
6	5247	21	
6.5	6989	21.5	
7	8033	22	
7.5	6870	22.5	
8	6948	23	
8.5	6721	23.5	
9	5779	24	
9.5	4417	24.5	
10	3489	25	
10.5	3848	25.5	
11	4076	26	
11.5	4292	26.5	
12	4014	27	
12.5	3459	27.5	
13	3258	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002
Technician: J. Farrens

Instrument Model No.: Ludlum 2221
Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-55
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3618	15.5	
1	4800	16	
1.5	5661	16.5	
2	5397	17	
2.5	3971	17.5	
3	2573	18	
3.5	2196	18.5	
4	2181	19	
4.5	2610	19.5	
5	3551	20	
5.5	4603	20.5	
6	6182	21	
6.5	6318	21.5	
7	5548	22	
7.5	5606	22.5	
8	6394	23	
8.5	8182	23.5	
9	7282	24	
9.5	5762	24.5	
10	6280	25	
10.5	7603	25.5	
11	7164	26	
11.5	6984	26.5	
12	7049	27	
12.5	6598	27.5	
13	5743	28	
13.5	6302	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002 | Technician: J. Farrens

Instrument Model No.: Ludlum 2221 | Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 | Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-56
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3653	15.5	
1	4251	16	
1.5	5651	16.5	
2	6306	17	
2.5	5583	17.5	
3	4006	18	
3.5	2718	18.5	
4	2801	19	
4.5	3164	19.5	
5	4349	20	
5.5	4142	20.5	
6	4696	21	
6.5	5270	21.5	
7	4640	22	
7.5	4541	22.5	
8	4630	23	
8.5	4551	23.5	
9	4302	24	
9.5	4445	24.5	
10	4377	25	
10.5	4380	25.5	
11	5071	26	
11.5	5407	26.5	
12	5352	27	
12.5	4873	27.5	
13	4746	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: J. Farrens

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-57
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3527	15.5	
1	4667	16	
1.5	4188	16.5	
2	4083	17	
2.5	3054	17.5	
3	2753	18	
3.5	3563	18.5	
4	4526	19	
4.5	4426	19.5	
5	4677	20	
5.5	4671	20.5	
6	4259	21	
6.5	4979	21.5	
7	5733	22	
7.5	6408	22.5	
8	6650	23	
8.5	5369	23.5	
9	4924	24	
9.5	5119	24.5	
10	6216	25	
10.5	7109	25.5	
11	6073	26	
11.5	5459	26.5	
12	5897	27	
12.5	5788	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 11, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 28, 982

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-58
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3528	15.5	
1	4356	16	
1.5	4876	16.5	
2	4731	17	
2.5	4720	17.5	
3	3933	18	
3.5	2801	18.5	
4	2723	19	
4.5	3782	19.5	
5	5830	20	
5.5	8377	20.5	
6	7514	21	
6.5	6443	21.5	
7	5861	22	
7.5	5566	22.5	
8	5773	23	
8.5	6553	23.5	
9	6373	24	
9.5	5986	24.5	
10	5020	25	
10.5	4345	25.5	
11	3998	26	
11.5	4178	26.5	
12	6234	27	
12.5	7387	27.5	
13	6842	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-59
Maximum Depth 12 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4267	15.5	
1	4681	16	
1.5	5064	16.5	
2	4869	17	
2.5	4365	17.5	
3	4253	18	
3.5	3141	18.5	
4	3410	19	
4.5	4878	19.5	
5	5992	20	
5.5	5631	20.5	
6	6063	21	
6.5	6398	21.5	
7	5676	22	
7.5	5355	22.5	
8	6185	23	
8.5	5605	23.5	
9	5533	24	
9.5	5975	24.5	
10	7189	25	
10.5	9264	25.5	
11	9767	26	
11.5	9967	26.5	
12	10,123	27	
12.5	9950	27.5	
12.11	9663	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-60
Maximum Depth 13 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3959	15.5	
1	3733	16	
1.5	3822	16.5	
2	4065	17	
2.5	3728	17.5	
3	5439	18	
3.5	6568	18.5	
4	6350	19	
4.5	5511	19.5	
5	5142	20	
5.5	5934	20.5	
6	6322	21	
6.5	5303	21.5	
7	5945	22	
7.5	5545	22.5	
8	5636	23	
8.5	5372	23.5	
9	3838	24	
9.5	3580	24.5	
10	4236	25	
10.5	7236	25.5	
11	8543	26	
11.5	8547	26.5	
12	8521	27	
12.5	8231	27.5	
13	7757	28	
13.4	7649	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-61
Maximum Depth 14 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4504	15.5	
1	5959	16	
1.5	5205	16.5	
2	5061	17	
2.5	5087	17.5	
3	5113	18	
3.5	6215	18.5	
4	6751	19	
4.5	7198	19.5	
5	7423	20	
5.5	6794	20.5	
6	5456	21	
6.5	4576	21.5	
7	5506	22	
7.5	6128	22.5	
8	6006	23	
8.5	6512	23.5	
9	6487	24	
9.5	5836	24.5	
10	4874	25	
10.5	5052	25.5	
11	6605	26	
11.5	6732	26.5	
12	6201	27	
12.5	7338	27.5	
13	8769	28	
13.5	9503	28.5	
14	10,032	29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002
Technician: Toby Shewan
Instrument Model No.: Ludlum 2221
Operational Check: 20,149
Serial No: 132844
Probe Model No.: PR 44-10
Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.
* Shielded (2")

Boring No.: D-62
Maximum Depth 13 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3416	15.5	
1	3743	16	
1.5	3024	16.5	
2	3636	17	
2.5	4539	17.5	
3	5153	18	
3.5	5386	18.5	
4	6740	19	
4.5	9731	19.5	
5	8935	20	
5.5	7116	20.5	
6	5405	21	
6.5	3625	21.5	
7	3009	22	
7.5	4267	22.5	
8	6124	23	
8.5	7741	23.5	
9	8749	24	
9.5	9071	24.5	
10	8870	25	
10.5	8188	25.5	
11	6577	26	
11.5	5608	26.5	
12	5873	27	
12.5	5680	27.5	
13	5467	28	
13.5	5081	28.5	
13.10	5106	29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-63
Maximum Depth 13 feet 1 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3310	15.5	
1	3817	16	
1.5	4013	16.5	
2	4116	17	
2.5	3193	17.5	
3	2549	18	
3.5	2940	18.5	
4	4446	19	
4.5	5479	19.5	
5	5127	20	
5.5	5745	20.5	
6	5108	21	
6.5	4785	21.5	
7	4574	22	
7.5	4288	22.5	
8	3971	23	
8.5	3935	23.5	
9	3967	24	
9.5	3504	24.5	
10	3274	25	
10.5	3399	25.5	
11	3872	26	
11.5	3963	26.5	
12	4345	27	
12.5	4845	27.5	
13	4891	28	
13.1	4764	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-64
Maximum Depth 12 feet 1 inch

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3782	15.5	
1	4573	16	
1.5	4525	16.5	
2	4374	17	
2.5	4368	17.5	
3	3645	18	
3.5	3088	18.5	
4	3465	19	
4.5	3783	19.5	
5	2636	20	
5.5	1843	20.5	
6	2022	21	
6.5	3533	21.5	
7	4520	22	
7.5	3982	22.5	
8	3962	23	
8.5	3946	23.5	
9	3719	24	
9.5	3667	24.5	
10	4822	25	
10.5	4943	25.5	
11	4898	26	
11.5	4642	26.5	
12	4854	27	
12.1	5054	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-65
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2890	15.5	
1	3888	16	
1.5	4713	16.5	
2	4760	17	
2.5	3976	17.5	
3	3769	18	
3.5	4924	18.5	
4	6034	19	
4.5	6237	19.5	
5	5834	20	
5.5	5566	20.5	
6	4558	21	
6.5	4357	21.5	
7	4483	22	
7.5	4831	22.5	
8	5041	23	
8.5	5111	23.5	
9	4980	24	
9.5	4490	24.5	
10	3491	25	
10.5	3393	25.5	
11	3525	26	
11.5	3802	26.5	
11.10	3368	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-66
Maximum Depth 12 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4713	15.5	
1	5266	16	
1.5	5208	16.5	
2	5308	17	
2.5	5794	17.5	
3	4037	18	
3.5	3389	18.5	
4	3437	19	
4.5	3430	19.5	
5	5325	20	
5.5	7323	20.5	
6	7432	21	
6.5	7249	21.5	
7	6882	22	
7.5	6345	22.5	
8	5844	23	
8.5	5037	23.5	
9	4647	24	
9.5	4397	24.5	
10	4346	25	
10.5	3882	25.5	
11	3741	26	
11.5	4010	26.5	
12	3831	27	
12.5	3995	27.5	
12.9	3971	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002
Technician: Toby Shewan

Instrument Model No.: Ludlum 2221
Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-67
Maximum Depth 13 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5152	15.5	
1	6294	16	
1.5	5901	16.5	
2	5045	17	
2.5	5205	17.5	
3	4332	18	
3.5	3890	18.5	
4	5725	19	
4.5	7017	19.5	
5	7999	20	
5.5	8011	20.5	
6	7940	21	
6.5	7299	21.5	
7	6485	22	
7.5	5726	22.5	
8	5117	23	
8.5	4625	23.5	
9	3701	24	
9.5	3365	24.5	
10	3987	25	
10.5	4857	25.5	
11	4061	26	
11.5	4454	26.5	
12	6254	27	
12.5	8063	27.5	
13	9070	28	
13.2	9008	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-68
Maximum Depth 12 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5193	15.5	
1	5285	16	
1.5	5163	16.5	
2	4561	17	
2.5	3673	17.5	
3	3717	18	
3.5	4948	18.5	
4	5010	19	
4.5	5521	19.5	
5	7272	20	
5.5	7752	20.5	
6	7567	21	
6.5	7925	21.5	
7	6789	22	
7.5	5085	22.5	
8	4424	23	
8.5	4944	23.5	
9	6363	24	
9.5	6964	24.5	
10	7329	25	
10.5	6159	25.5	
11	5427	26	
11.5	5233	26.5	
12	5322	27	
12.10	5044	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-69
Maximum Depth 14 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4680	15.5	
1	4913	16	
1.5	6055	16.5	
2	5062	17	
2.5	3214	17.5	
3	3312	18	
3.5	4332	18.5	
4	3598	19	
4.5	2721	19.5	
5	2869	20	
5.5	2903	20.5	
6	3599	21	
6.5	4038	21.5	
7	3792	22	
7.5	3787	22.5	
8	3944	23	
8.5	4841	23.5	
9	4667	24	
9.5	5017	24.5	
10	5959	25	
10.5	6811	25.5	
11	7884	26	
11.5	7581	26.5	
12	7666	27	
12.5	6126	27.5	
13	5985	28	
13.5	7266	28.5	
14	7731	29	
14.4	7524	29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-70
Maximum Depth 13 feet 10nches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4961	15.5	
1	5051	16	
1.5	5012	16.5	
2	5046	17	
2.5	6802	17.5	
3	7054	18	
3.5	5992	18.5	
4	5857	19	
4.5	6048	19.5	
5	5360	20	
5.5	5237	20.5	
6	6854	21	
6.5	7511	21.5	
7	8007	22	
7.5	8126	22.5	
8	7932	23	
8.5	7231	23.5	
9	7308	24	
9.5	7508	24.5	
10	8546	25	
10.5	9210	25.5	
11	8233	26	
11.5	6047	26.5	
12	4751	27	
12.5	4480	27.5	
13	5536	28	
13.5	6529	28.5	
13.10	7437	29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-71
Maximum Depth 13 feet 5inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	11,458	15.5	
1	7271	16	
1.5	8573	16.5	
2	11,586	17	
2.5	12,142	17.5	
3	12,396	18	
3.5	13,553	18.5	
4	19,765	19	
4.5	18,200	19.5	
5	19,204	20	
5.5	18,306	20.5	
6	21,517	21	
6.5	22,734	21.5	
7	26,375	22	
7.5	36,720	22.5	
8	92,897	23	
8.5	345,308	23.5	
9	610,257	24	
9.5	352,892	24.5	
10	137,760	25	
10.5	35,6565	25.5	
11	18,924	26	
11.5	12,787	26.5	
12	17,194	27	
12.5	10,927	27.5	
13	8837	28	
13.5	9749	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 23, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,067

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-71 A
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4729	15.5	
1	5100	16	
1.5	5338	16.5	
2	5676	17	
2.5	5129	17.5	
3	4183	18	
3.5	6760	18.5	
4	12,480	19	
4.5	10,017	19.5	
5	6840	20	
5.5	7468	20.5	
6	9715	21	
6.5	10,344	21.5	
7	10,270	22	
7.5	8749	22.5	
8	6152	23	
8.5	4957	23.5	
9	4471	24	
9.5	4599	24.5	
10	5061	25	
10.5	5046	25.5	
11	4376	26	
11.5	3782	26.5	
12	3568	27	
12.5	3826	27.5	
13	4289	28	
13.5	5607	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 23, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,067

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-71 B

Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4813	15.5	
1	5471	16	
1.5	6412	16.5	
2	5956	17	
2.5	6336	17.5	
3	7216	18	
3.5	7642	18.5	
4	9645	19	
4.5	9746	19.5	
5	8231	20	
5.5	6643	20.5	
6	6314	21	
6.5	7123	21.5	
7	8138	22	
7.5	8470	22.5	
8	8682	23	
8.5	8607	23.5	
9	8496	24	
9.5	7844	24.5	
10	8269	25	
10.5	9006	25.5	
11	8955	26	
11.5	8821	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 23, 2002
Technician: Toby Shewan
Instrument Model No.: Ludlum 2221
Operational Check: 19,067
Serial No: 132844
Probe Model No.: PR 44-10
Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.
* Shielded (2")

Boring No.: D-71 C
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4754	15.5	
1	5267	16	
1.5	5207	16.5	
2	5117	17	
2.5	5747	17.5	
3	5918	18	
3.5	4875	18.5	
4	4338	19	
4.5	5717	19.5	
5	7511	20	
5.5	7920	20.5	
6	8725	21	
6.5	9984	21.5	
7	11,700	22	
7.5	15,567	22.5	
8	9983	23	
8.5	7459	23.5	
9	7693	24	
9.5	7997	24.5	
10	9466	25	
10.5	15,060	25.5	
11	17,036	26	
11.5	11,873	26.5	
12	9387	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 23, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 19,067

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-71 D
Maximum Depth 13 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5059	15.5	
1	5109	16	
1.5	4551	16.5	
2	5456	17	
2.5	5975	17.5	
3	6672	18	
3.5	7973	18.5	
4	8164	19	
4.5	7754	19.5	
5	7573	20	
5.5	6627	20.5	
6	6776	21	
6.5	12,008	21.5	
7	12,986	22	
7.5	24,891	22.5	
8	87,027	23	
8.5	74,595	23.5	
9	24,520	24	
9.5	13,199	24.5	
10	10,551	25	
10.5	9963	25.5	
11	9290	26	
11.5	8717	26.5	
12	7321	27	
12.5	7139	27.5	
13	7567	28	
13.2	7214	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 23, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,067

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-71 E
Maximum Depth 13 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5856	15.5	
1	5983	16	
1.5	5904	16.5	
2	5813	17	
2.5	5107	17.5	
3	4813	18	
3.5	5425	18.5	
4	6716	19	
4.5	7072	19.5	
5	6757	20	
5.5	6257	20.5	
6	5918	21	
6.5	6598	21.5	
7	7223	22	
7.5	8429	22.5	
8	9196	23	
8.5	9068	23.5	
9	9330	24	
9.5	9621	24.5	
10	9533	25	
10.5	9820	25.5	
11	9442	26	
11.5	9331	26.5	
12	9339	27	
12.5	7698	27.5	
13	6831	28	
13.4	7021	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site

Down Hole Field Log

Project No. 32193ZH

Date: January 14, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,149

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-72

Maximum Depth 13 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4464	15.5	
1	4046	16	
1.5	3884	16.5	
2	3610	17	
2.5	3917	17.5	
3	4021	18	
3.5	4516	18.5	
4	5037	19	
4.5	5697	19.5	
5	6188	20	
5.5	6481	20.5	
6	6638	21	
6.5	6734	21.5	
7	4624	22	
7.5	2560	22.5	
8	2398	23	
8.5	3349	23.5	
9	4398	24	
9.5	5289	24.5	
10	5435	25	
10.5	5503	25.5	
11	5139	26	
11.5	4333	26.5	
12	4542	27	
12.5	4969	27.5	
13	5350	28	
13.9	6296	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002 Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-73
Maximum Depth 13 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3940	15.5	
1	4628	16	
1.5	5016	16.5	
2	5345	17	
2.5	6106	17.5	
3	8550	18	
3.5	11,059	18.5	
4	8280	19	
4.5	6127	19.5	
5	5955	20	
5.5	4494	20.5	
6	4581	21	
6.5	4745	21.5	
7	4645	22	
7.5	5191	22.5	
8	5270	23	
8.5	5050	23.5	
9	5165	24	
9.5	4537	24.5	
10	3178	25	
10.5	2584	25.5	
11	2361	26	
11.5	2222	26.5	
12	2232	27	
12.5	2684	27.5	
13	4854	28	
13.5	6669	28.5	
13.11	6701	29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-74
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4217	15.5	
1	5828	16	
1.5	6634	16.5	
2	7081	17	
2.5	7144	17.5	
3	6632	18	
3.5	5964	18.5	
4	5993	19	
4.5	6321	19.5	
5	5802	20	
5.5	5461	20.5	
6	4973	21	
6.5	4634	21.5	
7	5549	22	
7.5	6132	22.5	
8	6232	23	
8.5	5648	23.5	
9	5592	24	
9.5	5597	24.5	
10	5325	25	
10.5	5371	25.5	
11	5400	26	
11.5	6261	26.5	
12	6881	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002 — Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 — Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 — Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-75
Maximum Depth 12 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5439	15.5	
1	6239	16	
1.5	6536	16.5	
2	6920	17	
2.5	5931	17.5	
3	4352	18	
3.5	5036	18.5	
4	6505	19	
4.5	6727	19.5	
5	6158	20	
5.5	5878	20.5	
6	4794	21	
6.5	4024	21.5	
7	3912	22	
7.5	3941	22.5	
8	4921	23	
8.5	5894	23.5	
9	5705	24	
9.5	4903	24.5	
10	4706	25	
10.5	4184	25.5	
11	4023	26	
11.5	4021	26.5	
12	5098	27	
12.4	5044	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-76
Maximum Depth 13 feet 1 inch

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5174	15.5	
1	5486	16	
1.5	5736	16.5	
2	6048	17	
2.5	5932	17.5	
3	5884	18	
3.5	5679	18.5	
4	5699	19	
4.5	6499	19.5	
5	7276	20	
5.5	8349	20.5	
6	9088	21	
6.5	8537	21.5	
7	6486	22	
7.5	4765	22.5	
8	3437	23	
8.5	3518	23.5	
9	4433	24	
9.5	5155	24.5	
10	6404	25	
10.5	6335	25.5	
11	5339	26	
11.5	4881	26.5	
12	4984	27	
12.5	5359	27.5	
13	6151	28	
13.1	6266	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-77
Maximum Depth 14 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5668	15.5	
1	5911	16	
1.5	5934	16.5	
2	5381	17	
2.5	4026	17.5	
3	3636	18	
3.5	6043	18.5	
4	9054	19	
4.5	9816	19.5	
5	11,784	20	
5.5	18,754	20.5	
6	37,886	21	
6.5	19,156	21.5	
7	8990	22	
7.5	6738	22.5	
8	7940	23	
8.5	8295	23.5	
9	8164	24	
9.5	5873	24.5	
10	4798	25	
10.5	4605	25.5	
11	4225	26	
11.5	5233	26.5	
12	7711	27	
12.5	8165	27.5	
13	6162	28	
13.5	4993	28.5	
14	4611	29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-77 A
Maximum Depth 13 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4195	15.5	
1	4585	16	
1.5	4756	16.5	
2	3753	17	
2.5	3013	17.5	
3	2635	18	
3.5	2751	18.5	
4	3421	19	
4.5	6420	19.5	
5	8714	20	
5.5	9591	20.5	
6	10,786	21	
6.5	9938	21.5	
7	5956	22	
7.5	4905	22.5	
8	4687	23	
8.5	5344	23.5	
9	5864	24	
9.5	6215	24.5	
10	7613	25	
10.5	8182	25.5	
11	6047	26	
11.5	6545	26.5	
12	7640	27	
12.5	7524	27.5	
13	6714	28	
13.2	6732	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-77 B
Maximum Depth 13 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5053	15.5	
1	6146	16	
1.5	5906	16.5	
2	4628	17	
2.5	3192	17.5	
3	3575	18	
3.5	4374	18.5	
4	5885	19	
4.5	6118	19.5	
5	4681	20	
5.5	3862	20.5	
6	3972	21	
6.5	4166	21.5	
7	4661	22	
7.5	4070	22.5	
8	4361	23	
8.5	4810	23.5	
9	4266	24	
9.5	4356	24.5	
10	4544	25	
10.5	4888	25.5	
11	4578	26	
11.5	4554	26.5	
12	4614	27	
12.5	5172	27.5	
13	7253	28	
13.2	7276	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-77 C
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4393	15.5	
1	5039	16	
1.5	4705	16.5	
2	3344	17	
2.5	3753	17.5	
3	6384	18	
3.5	7623	18.5	
4	7755	19	
4.5	8166	19.5	
5	7308	20	
5.5	6530	20.5	
6	5555	21	
6.5	5000	21.5	
7	4911	22	
7.5	4158	22.5	
8	4567	23	
8.5	5174	23.5	
9	7125	24	
9.5	7025	24.5	
10	6388	25	
10.5	5730	25.5	
11	5363	26	
11.5	6298	26.5	
12	7165	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002
Technician: Toby Shewan
Instrument Model No.: Ludlum 2221
Operational Check: 20,323
Serial No: 132844
Probe Model No.: PR 44-10
Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.
* Shielded (2")

Boring No.: D-78
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4494	15.5	
1	5040	16	
1.5	5357	16.5	
2	5332	17	
2.5	5279	17.5	
3	5271	18	
3.5	5402	18.5	
4	5504	19	
4.5	5954	19.5	
5	6387	20	
5.5	6573	20.5	
6	7777	21	
6.5	7536	21.5	
7	6487	22	
7.5	6301	22.5	
8	5823	23	
8.5	6158	23.5	
9	7651	24	
9.5	7877	24.5	
10	7577	25	
10.5	8022	25.5	
11	8406	26	
11.5	7985	26.5	
12	7777	27	
12.5	7279	27.5	
13	5284	28	
13.5	4126	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-79
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5465	15.5	
1	7150	16	
1.5	6751	16.5	
2	5817	17	
2.5	5059	17.5	
3	5001	18	
3.5	5397	18.5	
4	6516	19	
4.5	7148	19.5	
5	6018	20	
5.5	6309	20.5	
6	5795	21	
6.5	5726	21.5	
7	5485	22	
7.5	5159	22.5	
8	5027	23	
8.5	6439	23.5	
9	6705	24	
9.5	5357	24.5	
10	5516	25	
10.5	5157	25.5	
11	4987	26	
11.5	4647	26.5	
12	4147	27	
12.5	4667	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-80
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4878	15.5	
1	6118	16	
1.5	6518	16.5	
2	5591	17	
2.5	5104	17.5	
3	4955	18	
3.5	4891	18.5	
4	5172	19	
4.5	5477	19.5	
5	6570	20	
5.5	7865	20.5	
6	7586	21	
6.5	6768	21.5	
7	7301	22	
7.5	6683	22.5	
8	6567	23	
8.5	6487	23.5	
9	7162	24	
9.5	8253	24.5	
10	8559	25	
10.5	8151	25.5	
11	7097	26	
11.5	5739	26.5	
12	5185	27	
12.5	5280	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-81
Maximum Depth 13 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4750	15.5	
1	5170	16	
1.5	5343	16.5	
2	6652	17	
2.5	7321	17.5	
3	6803	18	
3.5	5937	18.5	
4	5703	19	
4.5	5576	19.5	
5	5448	20	
5.5	6402	20.5	
6	5714	21	
6.5	6233	21.5	
7	6627	22	
7.5	5901	22.5	
8	4976	23	
8.5	4597	23.5	
9	4739	24	
9.5	4946	24.5	
10	4666	25	
10.5	5078	25.5	
11	4957	26	
11.5	4658	26.5	
12	4216	27	
12.5	4457	27.5	
13	5768	28	
13.5	5668	28.5	
13.9	6009	29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-82
Maximum Depth 13 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4314	15.5	
1	5310	16	
1.5	5003	16.5	
2	5619	17	
2.5	7212	17.5	
3	8112	18	
3.5	7937	18.5	
4	6312	19	
4.5	5364	19.5	
5	5463	20	
5.5	7352	20.5	
6	6735	21	
6.5	5585	21.5	
7	6039	22	
7.5	5914	22.5	
8	5816	23	
8.5	5439	23.5	
9	5118	24	
9.5	5669	24.5	
10	6917	25	
10.5	7669	25.5	
11	7581	26	
11.5	6987	26.5	
12	6473	27	
12.5	6737	27.5	
13	6908	28	
13.5	7301	28.5	
13.8	7393	29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002 Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 Cutoff Value = 7.2 pCi/gm =

* Shielded (2") 18,059 counts per 30 sec.

Boring No.: D-83
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5295	15.5	
1	6032	16	
1.5	5283	16.5	
2	5007	17	
2.5	4916	17.5	
3	4039	18	
3.5	2982	18.5	
4	3326	19	
4.5	5587	19.5	
5	6425	20	
5.5	5973	20.5	
6	5518	21	
6.5	5034	21.5	
7	5178	22	
7.5	5850	22.5	
8	6185	23	
8.5	5706	23.5	
9	5451	24	
9.5	5273	24.5	
10	5058	25	
10.5	4769	25.5	
11	4438	26	
11.5	3894	26.5	
12	3402	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-84
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4024	15.5	
1	4772	16	
1.5	4572	16.5	
2	4681	17	
2.5	4683	17.5	
3	4861	18	
3.5	4876	18.5	
4	5533	19	
4.5	5921	19.5	
5	5463	20	
5.5	5043	20.5	
6	5201	21	
6.5	5419	21.5	
7	6668	22	
7.5	7474	22.5	
8	7278	23	
8.5	5729	23.5	
9	5171	24	
9.5	6011	24.5	
10	6518	25	
10.5	6046	25.5	
11	6007	26	
11.5	6615	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-85
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4179	15.5	
1	4941	16	
1.5	4995	16.5	
2	5305	17	
2.5	5283	17.5	
3	5348	18	
3.5	5704	18.5	
4	7082	19	
4.5	7340	19.5	
5	7049	20	
5.5	6580	20.5	
6	5991	21	
6.5	5363	21.5	
7	4809	22	
7.5	4673	22.5	
8	5621	23	
8.5	5088	23.5	
9	3891	24	
9.5	4568	24.5	
10	6583	25	
10.5	7759	25.5	
11	7743	26	
11.5	7643	26.5	
12	7175	27	
12.5	7476	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-86
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3492	15.5	
1	4394	16	
1.5	3688	16.5	
2	3561	17	
2.5	3579	17.5	
3	4026	18	
3.5	4358	18.5	
4	6601	19	
4.5	8748	19.5	
5	9799	20	
5.5	9607	20.5	
6	8563	21	
6.5	6963	21.5	
7	6049	22	
7.5	5300	22.5	
8	4836	23	
8.5	4422	23.5	
9	4272	24	
9.5	4182	24.5	
10	3838	25	
10.5	3856	25.5	
11	4406	26	
11.5	4700	26.5	
12	4600	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-87
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3703	15.5	
1	5267	16	
1.5	4603	16.5	
2	4375	17	
2.5	4505	17.5	
3	6265	18	
3.5	6960	18.5	
4	7066	19	
4.5	7568	19.5	
5	7181	20	
5.5	5853	20.5	
6	4745	21	
6.5	4701	21.5	
7	6003	22	
7.5	5792	22.5	
8	6132	23	
8.5	7088	23.5	
9	7514	24	
9.5	7661	24.5	
10	7641	25	
10.5	7864	25.5	
11	8329	26	
11.5	7880	26.5	
12	5977	27	
12.5	6026	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-88
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4054	15.5	
1	4802	16	
1.5	4857	16.5	
2	5278	17	
2.5	5102	17.5	
3	5232	18	
3.5	4831	18.5	
4	3769	19	
4.5	3029	19.5	
5	4173	20	
5.5	5966	20.5	
6	6781	21	
6.5	6603	21.5	
7	6798	22	
7.5	5923	22.5	
8	5092	23	
8.5	3836	23.5	
9	3696	24	
9.5	3468	24.5	
10	3773	25	
10.5	3709	25.5	
11	3393	26	
11.5	4065	26.5	
12	5072	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002 — Technician: Dumas

Instrument Model No.: Ludlum 2221 — Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 — Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-89
Maximum Depth 11 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3883	15.5	
1	4547	16	
1.5	5133	16.5	
2	4872	17	
2.5	3289	17.5	
3	3070	18	
3.5	3787	18.5	
4	5571	19	
4.5	6671	19.5	
5	6110	20	
5.5	6303	20.5	
6	6751	21	
6.5	7049	21.5	
7	5582	22	
7.5	5452	22.5	
8	6197	23	
8.5	7887	23.5	
9	8799	24	
9.5	9379	24.5	
10	9053	25	
10.5	8521	25.5	
11	7366	26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-90
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4062	15.5	
1	5474	16	
1.5	6553	16.5	
2	4716	17	
2.5	4247	17.5	
3	4948	18	
3.5	4737	18.5	
4	4850	19	
4.5	4168	19.5	
5	4025	20	
5.5	4780	20.5	
6	6050	21	
6.5	7521	21.5	
7	7346	22	
7.5	6225	22.5	
8	5630	23	
8.5	5729	23.5	
9	6269	24	
9.5	6529	24.5	
10	6350	25	
10.5	5859	25.5	
11	5884	26	
11.5	6109	26.5	
12	5909	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-91
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3134	15.5	
1	3597	16	
1.5	4824	16.5	
2	5851	17	
2.5	5802	17.5	
3	6332	18	
3.5	6663	18.5	
4	7174	19	
4.5	6669	19.5	
5	5729	20	
5.5	5911	20.5	
6	6183	21	
6.5	6384	21.5	
7	6481	22	
7.5	7112	22.5	
8	7581	23	
8.5	7549	23.5	
9	6930	24	
9.5	6560	24.5	
10	7153	25	
10.5	8273	25.5	
11	8623	26	
11.5	8752	26.5	
12	8614	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002 Technician: Dumas

Instrument Model No.: Ludlum 2221 Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-92
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4073	15.5	
1	4372	16	
1.5	4470	16.5	
2	4086	17	
2.5	4180	17.5	
3	3887	18	
3.5	3535	18.5	
4	3802	19	
4.5	3616	19.5	
5	3690	20	
5.5	3927	20.5	
6	4878	21	
6.5	6138	21.5	
7	7257	22	
7.5	6902	22.5	
8	7533	23	
8.5	8649	23.5	
9	7253	24	
9.5	8639	24.5	
10	12,901	25	
10.5	7634	25.5	
11	6899	26	
11.5	7471	26.5	
12	7391	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-93
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3821	15.5	
1	4414	16	
1.5	4916	16.5	
2	4553	17	
2.5	5215	17.5	
3	6100	18	
3.5	7412	18.5	
4	7799	19	
4.5	8179	19.5	
5	8928	20	
5.5	11,450	20.5	
6	12,018	21	
6.5	9363	21.5	
7	7792	22	
7.5	6982	22.5	
8	5722	23	
8.5	4467	23.5	
9	4248	24	
9.5	4777	24.5	
10	6256	25	
10.5	7139	25.5	
11	6607	26	
11.5	5879	26.5	
12	5898	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 14, 2002 | Technician: Dumas

Instrument Model No.: Ludlum 2221 | Operational Check: 25,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 | Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-94
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	7695	15.5	
1	9256	16	
1.5	7793	16.5	
2	9718	17	
2.5	18,709	17.5	
3	56,082	18	
3.5	69,116	18.5	
4	21,089	19	
4.5	8605	19.5	
5	5523	20	
5.5	5576	20.5	
6	6139	21	
6.5	6093	21.5	
7	6239	22	
7.5	6669	22.5	
8	6805	23	
8.5	7194	23.5	
9	7777	24	
9.5	8117	24.5	
10	7838	25	
10.5	6237	25.5	
11	5971	26	
11.5	6982	26.5	
12	7809	27	
12.5	8811	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-94 A
Maximum Depth 13 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	6602	15.5	
1	7897	16	
1.5	9083	16.5	
2	9263	17	
2.5	13,745	17.5	
3	37,945	18	
3.5	75,027	18.5	
4	36,098	19	
4.5	16,175	19.5	
5	9200	20	
5.5	7482	20.5	
6	6305	21	
6.5	6142	21.5	
7	7504	22	
7.5	9130	22.5	
8	9492	23	
8.5	9192	23.5	
9	8446	24	
9.5	8419	24.5	
10	8460	25	
10.5	8110	25.5	
11	7640	26	
11.5	8128	26.5	
12	8757	27	
12.5	8930	27.5	
13	9144	28	
13.4	9046	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-94 B
Maximum Depth 11 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5609	15.5	
1	6140	16	
1.5	5275	16.5	
2	4381	17	
2.5	4289	17.5	
3	4039	18	
3.5	4306	18.5	
4	5519	19	
4.5	5838	19.5	
5	6024	20	
5.5	5692	20.5	
6	5325	21	
6.5	4864	21.5	
7	5223	22	
7.5	5284	22.5	
8	4862	23	
8.5	5121	23.5	
9	6243	24	
9.5	7935	24.5	
10	7689	25	
10.5	6959	25.5	
11	6860	26	
11.5	6698	26.5	
11.8	6547	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002 — Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 — Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 — Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-94 C
Maximum Depth 13 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5575	15.5	
1	6240	16	
1.5	6590	16.5	
2	7576	17	
2.5	5756	17.5	
3	5745	18	
3.5	6934	18.5	
4	6386	19	
4.5	6323	19.5	
5	6524	20	
5.5	6671	20.5	
6	7254	21	
6.5	7313	21.5	
7	7001	22	
7.5	6996	22.5	
8	6871	23	
8.5	7454	23.5	
9	6822	24	
9.5	7097	24.5	
10	7360	25	
10.5	7763	25.5	
11	8403	26	
11.5	8684	26.5	
12	8473	27	
12.5	8101	27.5	
13	7982	28	
13.4	8201	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-94 D

Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	10,855	15.5	
1	21,337	16	
1.5	47,881	16.5	
2	197,267	17	
2.5	108,328	17.5	
3	28,281	18	
3.5	11,672	18.5	
4	8485	19	
4.5	8202	19.5	
5	8649	20	
5.5	7998	20.5	
6	7598	21	
6.5	8110	21.5	
7	8134	22	
7.5	7577	22.5	
8	7140	23	
8.5	6255	23.5	
9	6216	24	
9.5	6701	24.5	
10	7383	25	
10.5	7797	25.5	
11	7592	26	
11.5	7472	26.5	
12	7831	27	
12.5	7900	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-94 E
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2842	15.5	
1	7749	16	
1.5	7685	16.5	
2	6864	17	
2.5	5599	17.5	
3	7210	18	
3.5	7499	18.5	
4	7235	19	
4.5	7464	19.5	
5	7557	20	
5.5	7036	20.5	
6	7168	21	
6.5	7273	21.5	
7	6430	22	
7.5	6026	22.5	
8	6628	23	
8.5	7266	23.5	
9	7174	24	
9.5	7510	24.5	
10	7930	25	
10.5	7490	25.5	
11	7415	26	
11.5	7234	26.5	
12	7358	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-94 E
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5822	15.5	
1	7237	16	
1.5	7331	16.5	
2	7178	17	
2.5	6975	17.5	
3	5560	18	
3.5	4536	18.5	
4	4255	19	
4.5	4083	19.5	
5	4498	20	
5.5	4617	20.5	
6	3782	21	
6.5	3339	21.5	
7	3651	22	
7.5	3990	22.5	
8	4143	23	
8.5	4750	23.5	
9	5929	24	
9.5	5767	24.5	
10	6984	25	
10.5	7623	25.5	
11	8125	26	
11.5	8136	26.5	
12	9065	27	
12.5	9142	27.5	
13	9551	28	
13.5	10,502	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 22, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,721

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-94 F
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5822	15.5	
1	7237	16	
1.5	7331	16.5	
2	7178	17	
2.5	6975	17.5	
3	5560	18	
3.5	4536	18.5	
4	4255	19	
4.5	4083	19.5	
5	4498	20	
5.5	4617	20.5	
6	3782	21	
6.5	3339	21.5	
7	3651	22	
7.5	3990	22.5	
8	4143	23	
8.5	4750	23.5	
9	5929	24	
9.5	5767	24.5	
10	6984	25	
10.5	7623	25.5	
11	8125	26	
11.5	8136	26.5	
12	9065	27	
12.5	9142	27.5	
13	9551	28	
13.5	10,502	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-95
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4094	15.5	
1	5109	16	
1.5	5112	16.5	
2	5695	17	
2.5	5554	17.5	
3	5890	18	
3.5	5801	18.5	
4	6450	19	
4.5	6371	19.5	
5	5810	20	
5.5	4906	20.5	
6	4698	21	
6.5	4637	21.5	
7	4210	22	
7.5	4443	22.5	
8	4711	23	
8.5	4675	23.5	
9	4544	24	
9.5	4391	24.5	
10	4767	25	
10.5	5149	25.5	
11	5707	26	
11.5	5884	26.5	
12	6754	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002 — Technician: Dumas

Instrument Model No.: Ludlum 2221 — Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 — Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-96
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3554	15.5	
1	4188	16	
1.5	4127	16.5	
2	3749	17	
2.5	3912	17.5	
3	4170	18	
3.5	5037	18.5	
4	5916	19	
4.5	6185	19.5	
5	6136	20	
5.5	6691	20.5	
6	6553	21	
6.5	5661	21.5	
7	4321	22	
7.5	4695	22.5	
8	5666	23	
8.5	5129	23.5	
9	4560	24	
9.5	4020	24.5	
10	4651	25	
10.5	6506	25.5	
11	6917	26	
11.5	5907	26.5	
12	5100	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-97
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3567	15.5	
1	4388	16	
1.5	4270	16.5	
2	3660	17	
2.5	2827	17.5	
3	2429	18	
3.5	2185	18.5	
4	2001	19	
4.5	2551	19.5	
5	2804	20	
5.5	2899	20.5	
6	3160	21	
6.5	3701	21.5	
7	4047	22	
7.5	4129	22.5	
8	4372	23	
8.5	5702	23.5	
9	5034	24	
9.5	5587	24.5	
10	5737	25	
10.5	5648	25.5	
11	5177	26	
11.5	5734	26.5	
12	5898	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002
Technician: Dumas

Instrument Model No.: Ludlum 2221
Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-98
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3875	15.5	
1	4032	16	
1.5	3711	16.5	
2	3398	17	
2.5	3594	17.5	
3	3504	18	
3.5	3716	18.5	
4	3929	19	
4.5	3815	19.5	
5	3389	20	
5.5	3292	20.5	
6	3332	21	
6.5	3317	21.5	
7	3620	22	
7.5	3813	22.5	
8	4303	23	
8.5	5107	23.5	
9	5620	24	
9.5	5287	24.5	
10	6283	25	
10.5	5744	25.5	
11	5174	26	
11.5	5284	26.5	
12	5694	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-99
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4529	15.5	
1	5465	16	
1.5	4631	16.5	
2	5532	17	
2.5	6414	17.5	
3	6214	18	
3.5	5265	18.5	
4	4776	19	
4.5	4462	19.5	
5	4782	20	
5.5	5187	20.5	
6	5435	21	
6.5	5739	21.5	
7	5887	22	
7.5	5726	22.5	
8	5428	23	
8.5	4939	23.5	
9	4637	24	
9.5	4793	24.5	
10	4863	25	
10.5	4841	25.5	
11	5019	26	
11.5	5906	26.5	
12	7017	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-100
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4289	15.5	
1	4927	16	
1.5	5338	16.5	
2	5360	17	
2.5	4547	17.5	
3	4505	18	
3.5	4723	18.5	
4	4717	19	
4.5	4962	19.5	
5	5243	20	
5.5	5412	20.5	
6	5917	21	
6.5	6998	21.5	
7	7617	22	
7.5	8622	22.5	
8	9310	23	
8.5	9405	23.5	
9	9537	24	
9.5	8923	24.5	
10	7575	25	
10.5	8046	25.5	
11	8764	26	
11.5	8487	26.5	
12	8304	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002 | Technician: Dumas

Instrument Model No.: Ludlum 2221 | Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 | Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-101
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4213	15.5	
1	5073	16	
1.5	5773	16.5	
2	6521	17	
2.5	5278	17.5	
3	4547	18	
3.5	4915	18.5	
4	6162	19	
4.5	7756	19.5	
5	8536	20	
5.5	8232	20.5	
6	7800	21	
6.5	7907	21.5	
7	7460	22	
7.5	7054	22.5	
8	7364	23	
8.5	7150	23.5	
9	6244	24	
9.5	5879	24.5	
10	5458	25	
10.5	5079	25.5	
11	4128	26	
11.5	4195	26.5	
12	5807	27	
12.5	6705	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002 — Technician: Dumas

Instrument Model No.: Ludlum 2221 — Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 — Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-102
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5658	15.5	
1	5629	16	
1.5	7558	16.5	
2	6345	17	
2.5	5822	17.5	
3	6099	18	
3.5	6936	18.5	
4	7196	19	
4.5	6354	19.5	
5	6274	20	
5.5	6562	20.5	
6	6757	21	
6.5	7098	21.5	
7	7359	22	
7.5	7303	22.5	
8	7181	23	
8.5	6332	23.5	
9	6366	24	
9.5	6616	24.5	
10	5156	25	
10.5	5341	25.5	
11	5766	26	
11.5	7158	26.5	
12	7609	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-103
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5100	15.5	
1	5563	16	
1.5	5458	16.5	
2	4684	17	
2.5	4247	17.5	
3	4507	18	
3.5	5340	18.5	
4	5930	19	
4.5	6461	19.5	
5	7290	20	
5.5	7229	20.5	
6	6872	21	
6.5	7370	21.5	
7	7464	22	
7.5	7523	22.5	
8	6736	23	
8.5	7335	23.5	
9	7859	24	
9.5	7664	24.5	
10	7859	25	
10.5	7664	25.5	
11	7476	26	
11.5	7224	26.5	
12	7522	27	
12.5	7537	27.5	
13	7853	28	
13.5	7846	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-104
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3270	15.5	
1	4985	16	
1.5	4922	16.5	
2	5102	17	
2.5	7243	17.5	
3	6510	18	
3.5	7221	18.5	
4	7371	19	
4.5	6722	19.5	
5	6355	20	
5.5	5574	20.5	
6	4815	21	
6.5	4590	21.5	
7	4211	22	
7.5	4257	22.5	
8	4271	23	
8.5	4232	23.5	
9	3540	24	
9.5	3762	24.5	
10	5481	25	
10.5	5702	25.5	
11	5163	26	
11.5	5054	26.5	
12	5931	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-105
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4169	15.5	
1	4696	16	
1.5	4893	16.5	
2	4626	17	
2.5	4530	17.5	
3	5632	18	
3.5	7657	18.5	
4	7003	19	
4.5	6657	19.5	
5	5484	20	
5.5	5413	20.5	
6	6023	21	
6.5	6161	21.5	
7	6145	22	
7.5	5791	22.5	
8	5652	23	
8.5	5220	23.5	
9	5012	24	
9.5	5190	24.5	
10	4984	25	
10.5	4943	25.5	
11	4964	26	
11.5	4597	26.5	
12	5396	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-106
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3294	15.5	
1	4231	16	
1.5	4375	16.5	
2	4434	17	
2.5	4751	17.5	
3	6865	18	
3.5	8860	18.5	
4	8311	19	
4.5	7465	19.5	
5	6505	20	
5.5	5576	20.5	
6	5511	21	
6.5	4908	21.5	
7	4668	22	
7.5	5004	22.5	
8	6083	23	
8.5	5709	23.5	
9	5821	24	
9.5	6135	24.5	
10	5227	25	
10.5	5657	25.5	
11	6300	26	
11.5	6963	26.5	
12	7209	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-107
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4479	15.5	
1	4911	16	
1.5	4801	16.5	
2	4867	17	
2.5	5302	17.5	
3	5202	18	
3.5	5419	18.5	
4	6337	19	
4.5	7495	19.5	
5	7243	20	
5.5	6138	20.5	
6	6811	21	
6.5	7540	21.5	
7	7277	22	
7.5	7080	22.5	
8	6567	23	
8.5	6308	23.5	
9	6341	24	
9.5	5906	24.5	
10	5330	25	
10.5	4886	25.5	
11	4888	26	
11.5	5604	26.5	
12	6005	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-108
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4655	15.5	
1	5296	16	
1.5	5679	16.5	
2	5507	17	
2.5	5714	17.5	
3	6002	18	
3.5	7880	18.5	
4	8729	19	
4.5	9932	19.5	
5	10,561	20	
5.5	10,697	20.5	
6	10,661	21	
6.5	10,362	21.5	
7	9974	22	
7.5	8812	22.5	
8	7450	23	
8.5	6882	23.5	
9	7162	24	
9.5	6904	24.5	
10	6414	25	
10.5	6336	25.5	
11	6604	26	
11.5	7233	26.5	
12	7459	27	
12.5	8249	27.5	
13	8647	28	
13.5	8447	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-109
Maximum Depth 12 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4436	15.5	
1	5727	16	
1.5	6310	16.5	
2	9998	17	
2.5	10,655	17.5	
3	10,151	18	
3.5	11,227	18.5	
4	11,351	19	
4.5	11,127	19.5	
5	10,579	20	
5.5	9743	20.5	
6	8412	21	
6.5	6491	21.5	
7	5896	22	
7.5	5822	22.5	
8	5906	23	
8.5	6013	23.5	
9	6050	24	
9.5	6499	24.5	
10	7380	25	
10.5	7561	25.5	
11	8782	26	
11.5	9213	26.5	
12	9676	27	
12.5	8682	27.5	
12.9	7675	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-110
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4393	15.5	
1	4613	16	
1.5	4543	16.5	
2	4878	17	
2.5	5051	17.5	
3	5720	18	
3.5	8539	18.5	
4	10,1065	19	
4.5	10,820	19.5	
5	9940	20	
5.5	8830	20.5	
6	6910	21	
6.5	7340	21.5	
7	6920	22	
7.5	6032	22.5	
8	5528	23	
8.5	6539	23.5	
9	7071	24	
9.5	6732	24.5	
10	5029	25	
10.5	3513	25.5	
11	2620	26	
11.5	2829	26.5	
12	4113	27	
12.5	4356	27.5	
13	4764	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-111
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5084	15.5	
1	6166	16	
1.5	6312	16.5	
2	6528	17	
2.5	6371	17.5	
3	5067	18	
3.5	4117	18.5	
4	4290	19	
4.5	4544	19.5	
5	4929	20	
5.5	5379	20.5	
6	6174	21	
6.5	6476	21.5	
7	6867	22	
7.5	6915	22.5	
8	6309	23	
8.5	5308	23.5	
9	5065	24	
9.5	5923	24.5	
10	6110	25	
10.5	6240	25.5	
11	6051	26	
11.5	5608	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-112
Maximum Depth 11 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4325	15.5	
1	5174	16	
1.5	5744	16.5	
2	5102	17	
2.5	4280	17.5	
3	3700	18	
3.5	3859	18.5	
4	5087	19	
4.5	4904	19.5	
5	5897	20	
5.5	8367	20.5	
6	9440	21	
6.5	8896	21.5	
7	7681	22	
7.5	6850	22.5	
8	6455	23	
8.5	6476	23.5	
9	6624	24	
9.5	6749	24.5	
10	6538	25	
10.5	6257	25.5	
11	5874	26	
11.3	5302	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 15, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,323

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-113
Maximum Depth 10 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4022	15.5	
1	4926	16	
1.5	5229	16.5	
2	5294	17	
2.5	5464	17.5	
3	5649	18	
3.5	5705	18.5	
4	6423	19	
4.5	8038	19.5	
5	10,021	20	
5.5	10,330	20.5	
6	9628	21	
6.5	8645	21.5	
7	8368	22	
7.5	7541	22.5	
8	6529	23	
8.5	6507	23.5	
9	6762	24	
9.5	7401	24.5	
10	6385	25	
10.5	5563	25.5	
10.8	5203	26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-114
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4596	15.5	
1	5484	16	
1.5	5271	16.5	
2	5177	17	
2.5	5144	17.5	
3	5072	18	
3.5	5307	18.5	
4	5441	19	
4.5	4939	19.5	
5	5385	20	
5.5	6592	20.5	
6	7084	21	
6.5	7715	21.5	
7	7044	22	
7.5	6231	22.5	
8	4961	23	
8.5	5345	23.5	
9	6613	24	
9.5	6838	24.5	
10	7032	25	
10.5	7054	25.5	
11	6507	26	
11.5	5225	26.5	
12	5964	27	
12.5	5660	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002
Technician: Toby Shewan
Instrument Model No.: Ludlum 2221
Operational Check: 19,214
Serial No: 132844
Probe Model No.: PR 44-10
Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.
* Shielded (2")

Boring No.: D-115
Maximum Depth 12 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3131	15.5	
1	4481	16	
1.5	5487	16.5	
2	6404	17	
2.5	6147	17.5	
3	4653	18	
3.5	3858	18.5	
4	5596	19	
4.5	5391	19.5	
5	4899	20	
5.5	6164	20.5	
6	7686	21	
6.5	7702	21.5	
7	6988	22	
7.5	6593	22.5	
8	6184	23	
8.5	6214	23.5	
9	6798	24	
9.5	6661	24.5	
10	6844	25	
10.5	6468	25.5	
11	5092	26	
11.5	4301	26.5	
12	4793	27	
12.5	6567	27.5	
12.11	7120	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-116
Maximum Depth 7 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4660	15.5	
1	5199	16	
1.5	5176	16.5	
2	5507	17	
2.5	5304	17.5	
3	4447	18	
3.5	3430	18.5	
4	4353	19	
4.5	5232	19.5	
5	5836	20	
5.5	7579	20.5	
6	8851	21	
6.5	9032	21.5	
7	9114	22	
7.5	8794	22.5	
7.9	8466	23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-117
Maximum Depth 11 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4562	15.5	
1	5603	16	
1.5	5043	16.5	
2	4127	17	
2.5	4040	17.5	
3	4521	18	
3.5	6023	18.5	
4	5919	19	
4.5	6838	19.5	
5	6589	20	
5.5	5731	20.5	
6	5365	21	
6.5	5260	21.5	
7	5465	22	
7.5	5192	22.5	
8	4982	23	
8.5	4857	23.5	
9	4704	24	
9.5	4891	24.5	
10	6196	25	
10.5	6123	25.5	
11	5455	26	
11.5	4384	26.5	
11.11	3637	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-118
Maximum Depth 10 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3127	15.5	
1	4336	16	
1.5	4361	16.5	
2	4091	17	
2.5	4208	17.5	
3	4756	18	
3.5	4792	18.5	
4	4486	19	
4.5	5657	19.5	
5	6094	20	
5.5	5935	20.5	
6	6081	21	
6.5	5162	21.5	
7	5045	22	
7.5	4640	22.5	
8	4874	23	
8.5	5312	23.5	
9	5577	24	
9.5	5682	24.5	
10	5650	25	
10.5	5855	25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-119
Maximum Depth 14 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3826	15.5	
1	4388	16	
1.5	4397	16.5	
2	3745	17	
2.5	4718	17.5	
3	5274	18	
3.5	6324	18.5	
4	7331	19	
4.5	7972	19.5	
5	8743	20	
5.5	8311	20.5	
6	8169	21	
6.5	7519	21.5	
7	7517	22	
7.5	6932	22.5	
8	6800	23	
8.5	5716	23.5	
9	4789	24	
9.5	4205	24.5	
10	4307	25	
10.5	4913	25.5	
11	6871	26	
11.5	6868	26.5	
12	5725	27	
12.5	5374	27.5	
13	5950	28	
13.5	6865	28.5	
14	8269	29	
14.4	8328	29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002
Technician: Toby Shewan
Instrument Model No.: Ludlum 2221
Operational Check: 19,214
Serial No: 132844
Probe Model No.: PR 44-10
Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.
* Shielded (2")

Boring No.: D-120
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4259	15.5	
1	4386	16	
1.5	4330	16.5	
2	4299	17	
2.5	4577	17.5	
3	5404	18	
3.5	5992	18.5	
4	5614	19	
4.5	5083	19.5	
5	5120	20	
5.5	4656	20.5	
6	5039	21	
6.5	5059	21.5	
7	4752	22	
7.5	4309	22.5	
8	4146	23	
8.5	3919	23.5	
9	4425	24	
9.5	4991	24.5	
10	5206	25	
10.5	5733	25.5	
11	6153	26	
11.5	6331	26.5	
12	4921	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-121
Maximum Depth 12 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4518	15.5	
1	6030	16	
1.5	6220	16.5	
2	5070	17	
2.5	4563	17.5	
3	4371	18	
3.5	4740	18.5	
4	5970	19	
4.5	8503	19.5	
5	9553	20	
5.5	9381	20.5	
6	8446	21	
6.5	7089	21.5	
7	6299	22	
7.5	6003	22.5	
8	6120	23	
8.5	5997	23.5	
9	5711	24	
9.5	4626	24.5	
10	4551	25	
10.5	5264	25.5	
11	5321	26	
11.5	3793	26.5	
12	3091	27	
12.5	3379	27.5	
12.10	4473	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002 | Technician: J. Ferrans

Instrument Model No.: Ludlum 2221 | Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 | Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-122
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3638	15.5	
1	4079	16	
1.5	4142	16.5	
2	4827	17	
2.5	5174	17.5	
3	4365	18	
3.5	3674	18.5	
4	3397	19	
4.5	3433	19.5	
5	4704	20	
5.5	5341	20.5	
6	6837	21	
6.5	6764	21.5	
7	5602	22	
7.5	4512	22.5	
8	4014	23	
8.5	4113	23.5	
9	4708	24	
9.5	5459	24.5	
10	6159	25	
10.5	6124	25.5	
11	7284	26	
11.5	6161	26.5	
12	4466	27	
12.5	4235	27.5	
13	4247	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: J. Ferrans

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-123
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3223	15.5	
1	3568	16	
1.5	3958	16.5	
2	4574	17	
2.5	5050	17.5	
3	4615	18	
3.5	4082	18.5	
4	3791	19	
4.5	3345	19.5	
5	4178	20	
5.5	5082	20.5	
6	5243	21	
6.5	5361	21.5	
7	5559	22	
7.5	5733	22.5	
8	5385	23	
8.5	4830	23.5	
9	5034	24	
9.5	4666	24.5	
10	4320	25	
10.5	4436	25.5	
11	5385	26	
11.5	4937	26.5	
12	4020	27	
12.5	3845	27.5	
13	3561	28	
13.5	3982	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: J. Ferrans

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-124
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3765	15.5	
1	4646	16	
1.5	3612	16.5	
2	2381	17	
2.5	2220	17.5	
3	2807	18	
3.5	3440	18.5	
4	3894	19	
4.5	3884	19.5	
5	3307	20	
5.5	2638	20.5	
6	2272	21	
6.5	2240	21.5	
7	2364	22	
7.5	2849	22.5	
8	357	23	
8.5	3106	23.5	
9	2526	24	
9.5	2239	24.5	
10	2214	25	
10.5	2443	25.5	
11	2599	26	
11.5	2338	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002 — Technician: J. Ferrans

Instrument Model No.: Ludlum 2221 — Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 — Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-125
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2521	15.5	
1	2991	16	
1.5	5592	16.5	
2	6671	17	
2.5	6426	17.5	
3	6103	18	
3.5	4371	18.5	
4	3521	19	
4.5	3192	19.5	
5	2962	20	
5.5	2856	20.5	
6	2948	21	
6.5	2907	21.5	
7	2507	22	
7.5	2441	22.5	
8	2654	23	
8.5	4460	23.5	
9	6708	24	
9.5	9430	24.5	
10	11,463	25	
10.5	15,000	25.5	
11	20,519	26	
11.5	38,187	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: J. Ferrans

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-126
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3838	15.5	
1	4741	16	
1.5	6753	16.5	
2	7825	17	
2.5	7406	17.5	
3	6562	18	
3.5	5869	18.5	
4	5646	19	
4.5	5579	19.5	
5	4822	20	
5.5	4908	20.5	
6	5130	21	
6.5	5613	21.5	
7	5313	22	
7.5	5271	22.5	
8	3789	23	
8.5	2384	23.5	
9	1928	24	
9.5	2437	24.5	
10	3414	25	
10.5	3612	25.5	
11	4132	26	
11.5	4142	26.5	
12	3463	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: J. Ferrans

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-127
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3904	15.5	
1	5372	16	
1.5	6090	16.5	
2	6443	17	
2.5	7658	17.5	
3	8344	18	
3.5	8914	18.5	
4	8631	19	
4.5	8702	19.5	
5	8771	20	
5.5	7757	20.5	
6	6077	21	
6.5	6136	21.5	
7	6462	22	
7.5	5753	22.5	
8	5611	23	
8.5	5141	23.5	
9	4481	24	
9.5	4580	24.5	
10	4745	25	
10.5	4707	25.5	
11	4016	26	
11.5	2979	26.5	
12	3264	27	
12.5	4085	27.5	
13	4403	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: J. Ferrans

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-128
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3702	15.5	
1	5412	16	
1.5	5683	16.5	
2	6710	17	
2.5	5405	17.5	
3	3953	18	
3.5	5502	18.5	
4	7383	19	
4.5	6940	19.5	
5	8023	20	
5.5	8500	20.5	
6	7932	21	
6.5	6470	21.5	
7	6085	22	
7.5	5883	22.5	
8	5168	23	
8.5	4165	23.5	
9	4022	24	
9.5	5545	24.5	
10	6984	25	
10.5	7267	25.5	
11	7288	26	
11.5	7257	26.5	
12	6955	27	
12.5	7012	27.5	
13	6807	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-129
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5187	15.5	
1	5461	16	
1.5	5182	16.5	
2	4726	17	
2.5	4376	17.5	
3	4005	18	
3.5	4468	18.5	
4	5284	19	
4.5	4842	19.5	
5	3876	20	
5.5	2802	20.5	
6	4153	21	
6.5	4879	21.5	
7	4370	22	
7.5	4973	22.5	
8	5411	23	
8.5	4998	23.5	
9	4912	24	
9.5	4571	24.5	
10	3584	25	
10.5	2811	25.5	
11	2918	26	
11.5	3225	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: J. Ferrans

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-130

Maximum Depth 9 feet 5 inches (Collapsed Hole)

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4986	15.5	
1	5403	16	
1.5	5039	16.5	
2	4978	17	
2.5	4472	17.5	
3	4333	18	
3.5	4073	18.5	
4	3372	19	
4.5	2766	19.5	
5	2423	20	
5.5	2531	20.5	
6	3252	21	
6.5	4038	21.5	
7	3826	22	
7.5	4070	22.5	
8	4402	23	
8.5	4620	23.5	
9	4329	24	
9.5	4156	24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-131
Maximum Depth 11 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4931	15.5	
1	5784	16	
1.5	5751	16.5	
2	5142	17	
2.5	4822	17.5	
3	5068	18	
3.5	5209	18.5	
4	4892	19	
4.5	4276	19.5	
5	3764	20	
5.5	3751	20.5	
6	3832	21	
6.5	4185	21.5	
7	4190	22	
7.5	4216	22.5	
8	3967	23	
8.5	4517	23.5	
9	3243	24	
9.5	2855	24.5	
10	3045	25	
10.5	3561	25.5	
11	3615	26	
11.4	3351	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-132
Maximum Depth 11 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	6032	15.5	
1	6363	16	
1.5	5933	16.5	
2	5655	17	
2.5	6189	17.5	
3	6561	18	
3.5	6634	18.5	
4	6623	19	
4.5	6012	19.5	
5	5270	20	
5.5	4671	20.5	
6	4385	21	
6.5	4051	21.5	
7	3753	22	
7.5	3036	22.5	
8	2383	23	
8.5	2464	23.5	
9	2707	24	
9.5	2715	24.5	
10	2913	25	
10.5	3076	25.5	
11	3570	26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: J. Ferrans

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-133
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4915	15.5	
1	6996	16	
1.5	9406	16.5	
2	9704	17	
2.5	10,1011	17.5	
3	10,267	18	
3.5	9336	18.5	
4	7909	19	
4.5	6210	19.5	
5	5342	20	
5.5	5333	20.5	
6	4684	21	
6.5	6191	21.5	
7	7303	22	
7.5	7172	22.5	
8	7462	23	
8.5	6801	23.5	
9	7302	24	
9.5	7283	24.5	
10	6321	25	
10.5	6219	25.5	
11	6008	26	
11.5	5834	26.5	
12	5937	27	
12.5	6103	27.5	
13	6538	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-134
Maximum Depth 13 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3725	15.5	
1	4577	16	
1.5	6166	16.5	
2	8214	17	
2.5	9098	17.5	
3	9421	18	
3.5	10,023	18.5	
4	9515	19	
4.5	6995	19.5	
5	7519	20	
5.5	5860	20.5	
6	5704	21	
6.5	7817	21.5	
7	8524	22	
7.5	7486	22.5	
8	8785	23	
8.5	9061	23.5	
9	7806	24	
9.5	7132	24.5	
10	6698	25	
10.5	4806	25.5	
11	3480	26	
11.5	3144	26.5	
12	3913	27	
12.5	5196	27.5	
13	5377	28	
13.5	5050	28.5	
13.10	5065	29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002 — Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 — Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 — Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: D-135
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4694	15.5	
1	5074	16	
1.5	5046	16.5	
2	5101	17	
2.5	6032	17.5	
3	6432	18	
3.5	4469	18.5	
4	3981	19	
4.5	3323	19.5	
5	3099	20	
5.5	3685	20.5	
6	3823	21	
6.5	3884	21.5	
7	3359	22	
7.5	3691	22.5	
8	4557	23	
8.5	4405	23.5	
9	4416	24	
9.5	4711	24.5	
10	4797	25	
10.5	4151	25.5	
11	4270	26	
11.5	4351	26.5	
12	4420	27	
12.5	4400	27.5	
13	3969	28	
13.5	4019	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: J. Ferrans

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: D-136
Maximum Depth 11 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3456	15.5	
1	3296	16	
1.5	3801	16.5	
2	4360	17	
2.5	4414	17.5	
3	4355	18	
3.5	4541	18.5	
4	5743	19	
4.5	6435	19.5	
5	5856	20	
5.5	6919	20.5	
6	7676	21	
6.5	7926	21.5	
7	7345	22	
7.5	6451	22.5	
8	5742	23	
8.5	6267	23.5	
9	7373	24	
9.5	7644	24.5	
10	7239	25	
10.5	6948	25.5	
11	7048	26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 3, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18972

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-1

Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4742	15.5	
1	5975	16	
1.5	6341	16.5	
2	5507	17	
2.5	3489	17.5	
3	2504	18	
3.5	3619	18.5	
4	5025	19	
4.5	5590	19.5	
5	7491	20	
5.5	8240	20.5	
6	8032	21	
6.5	7747	21.5	
7	7678	22	
7.5	6471	22.5	
8	5312	23	
8.5	4955	23.5	
9	5271	24	
9.5	5543	24.5	
10	5625	25	
10.5	5921	25.5	
11	5572	26	
11.5	5996	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 3, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18972

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-2
Maximum Depth 11 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5108	15.5	
1	6282	16	
1.5	6885	16.5	
2	6760	17	
2.5	6515	17.5	
3	6469	18	
3.5	7159	18.5	
4	7090	19	
4.5	6620	19.5	
5	6520	20	
5.5	5370	20.5	
6	4662	21	
6.5	3885	21.5	
7	3743	22	
7.5	3542	22.5	
8	3342	23	
8.5	3226	23.5	
9	4337	24	
9.5	4091	24.5	
10	3252	25	
10.5	2976	25.5	
11	3076	26	
11.5	3620	26.5	
11.9	4247	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 3, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18972

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-3
Maximum Depth 12 feet 10 iches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4954	15.5	
1	4608	16	
1.5	3963	16.5	
2	4427	17	
2.5	4487	17.5	
3	5486	18	
3.5	6670	18.5	
4	6911	19	
4.5	6507	19.5	
5	5692	20	
5.5	5495	20.5	
6	5087	21	
6.5	5120	21.5	
7	5047	22	
7.5	5147	22.5	
8	5573	23	
8.5	6070	23.5	
9	6135	24	
9.5	6031	24.5	
10	6485	25	
10.5	7335	25.5	
11	8009	26	
11.5	7175	26.5	
12	6791	27	
12.10	7650	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 3, 2002
Technician: Toby Shewan

Instrument Model No.: Ludlum 2221
Operational Check: 18972

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-4
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5730	15.5	
1	6554	16	
1.5	6156	16.5	
2	5786	17	
2.5	5466	17.5	
3	5687	18	
3.5	5829	18.5	
4	5914	19	
4.5	5810	19.5	
5	5038	20	
5.5	4525	20.5	
6	4225	21	
6.5	3895	21.5	
7	3252	22	
7.5	2737	22.5	
8	2539	23	
8.5	2588	23.5	
9	3073	24	
9.5	3883	24.5	
10	4720	25	
10.5	3884	25.5	
11	7112	26	
11.5	6260	26.5	
11.10	6612	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 3, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18972

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-5 – S KIPPED ELCTRICAL LINE PASSES

Maximum Depth

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5		15.5	
1		16	
1.5		16.5	
2		17	
2.5		17.5	
3		18	
3.5		18.5	
4		19	
4.5		19.5	
5		20	
5.5		20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 3, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18972

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-6
Maximum Depth 11 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3318	15.5	
1	3271	16	
1.5	3289	16.5	
2	3803	17	
2.5	3781	17.5	
3	4019	18	
3.5	3993	18.5	
4	4847	19	
4.5	5573	19.5	
5	6250	20	
5.5	5543	20.5	
6	5757	21	
6.5	6065	21.5	
7	6075	22	
7.5	5618	22.5	
8	5202	23	
8.5	5102	23.5	
9	4320	24	
9.5	3589	24.5	
10	2420	25	
10.5	1965	25.5	
11	1857	26	
11.5	1917	26.5	
11.9	1988	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-7

Maximum Depth 12 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4336	15.5	
1	4853	16	
1.5	5074	16.5	
2	4669	17	
2.5	5075	17.5	
3	6851	18	
3.5	8114	18.5	
4	8379	19	
4.5	8621	19.5	
5	10,852	20	
5.5	8680	20.5	
6	7005	21	
6.5	5691	21.5	
7	4049	22	
7.5	4308	22.5	
8	5328	23	
8.5	6481	23.5	
9	7265	24	
9.5	6678	24.5	
10	6474	25	
10.5	6010	25.5	
11	5847	26	
11.5	6110	26.5	
12	6230	27	
12.2	6434	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-8
Maximum Depth 12 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4588	15.5	
1	4828	16	
1.5	4576	16.5	
2	5257	17	
2.5	5662	17.5	
3	6434	18	
3.5	7895	18.5	
4	7971	19	
4.5	7862	19.5	
5	6906	20	
5.5	6282	20.5	
6	6439	21	
6.5	6162	21.5	
7	6433	22	
7.5	6919	22.5	
8	7479	23	
8.5	6714	23.5	
9	6017	24	
9.5	5581	24.5	
10	5195	25	
10.5	5053	25.5	
11	5537	26	
11.5	6611	26.5	
12	7502	27	
12.5	7749	27.5	
12.9	7744	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-9
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5754	15.5	
1	6055	16	
1.5	6559	16.5	
2	7634	17	
2.5	10,029	17.5	
3	9619	18	
3.5	7975	18.5	
4	7098	19	
4.5	7825	19.5	
5	8122	20	
5.5	8546	20.5	
6	9019	21	
6.5	8841	21.5	
7	7072	22	
7.5	6579	22.5	
8	6753	23	
8.5	6882	23.5	
9	6800	24	
9.5	7170	24.5	
10	7487	25	
10.5	7224	25.5	
11	7329	26	
11.5	7135	26.5	
12	7056	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-10
Maximum Depth 12

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4021	15.5	
1	2672	16	
1.5	2711	16.5	
2	4138	17	
2.5	4206	17.5	
3	3365	18	
3.5	4243	18.5	
4	5081	19	
4.5	5048	19.5	
5	6049	20	
5.5	7824	20.5	
6	8077	21	
6.5	7124	21.5	
7	7131	22	
7.5	6427	22.5	
8	6628	23	
8.5	6005	23.5	
9	6062	24	
9.5	5881	24.5	
10	5877	25	
10.5	5658	25.5	
11	5961	26	
11.5	6518	26.5	
12	6742	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-11
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3773	15.5	
1	4126	16	
1.5	4261	16.5	
2	50,409	17	
2.5	3290	17.5	
3	2514	18	
3.5	3593	18.5	
4	4874	19	
4.5	4272	19.5	
5	5749	20	
5.5	8887	20.5	
6	9628	21	
6.5	9542	21.5	
7	8621	22	
7.5	7115	22.5	
8	6517	23	
8.5	5773	23.5	
9	5458	24	
9.5	5354	24.5	
10	6236	25	
10.5	5585	25.5	
11	5031	26	
11.5	5135	26.5	
11.10	5176	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,043

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-12
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4376	15.5	
1	5115	16	
1.5	6518	16.5	
2	6843	17	
2.5	2808	17.5	
3	3991	18	
3.5	4206	18.5	
4	3803	19	
4.5	5562	19.5	
5	7381	20	
5.5	7827	20.5	
6	7374	21	
6.5	6600	21.5	
7	6501	22	
7.5	6303	22.5	
8	6379	23	
8.5	5189	23.5	
9	4559	24	
9.5	5014	24.5	
10	5282	25	
10.5	4624	25.5	
11	4066	26	
11.10	4159	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,043

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-13
Maximum Depth 12 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4268	15.5	
1	5315	16	
1.5	4304	16.5	
2	5412	17	
2.5	5765	17.5	
3	6095	18	
3.5	6709	18.5	
4	6093	19	
4.5	5392	19.5	
5	4850	20	
5.5	4738	20.5	
6	4665	21	
6.5	4928	21.5	
7	4656	22	
7.5	4708	22.5	
8	4686	23	
8.5	5964	23.5	
9	6425	24	
9.5	5633	24.5	
10	5050	25	
10.5	4978	25.5	
11	5471	26	
11.5	5933	26.5	
12	6530	27	
12.4	6579	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site

Down Hole Field Log

Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-14

Maximum Depth 11 feet 1 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3640	15.5	
1	5185	16	
1.5	5470	16.5	
2	4818	17	
2.5	6421	17.5	
3	8071	18	
3.5	7009	18.5	
4	5956	19	
4.5	5412	19.5	
5	5531	20	
5.5	5777	20.5	
6	5866	21	
6.5	6050	21.5	
7	6016	22	
7.5	5781	22.5	
8	5779	23	
8.5	5917	23.5	
9	5894	24	
9.5	5578	24.5	
10	6149	25	
10.5	6407	25.5	
11	5783	26	
11.1	5659	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-15

Maximum Depth 12 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3020	15.5	
1	2890	16	
1.5	3015	16.5	
2	4234	17	
2.5	4915	17.5	
3	5143	18	
3.5	4981	18.5	
4	5134	19	
4.5	5635	19.5	
5	5774	20	
5.5	5697	20.5	
6	5533	21	
6.5	5647	21.5	
7	5685	22	
7.5	5266	22.5	
8	5492	23	
8.5	5985	23.5	
9	6019	24	
9.5	5510	24.5	
10	5440	25	
10.5	5563	25.5	
11	5937	26	
11.5	6115	26.5	
12	6305	27	
12.5	6186	27.5	
13	6156	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-16
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3943	15.5	
1	4276	16	
1.5	4067	16.5	
2	4386	17	
2.5	5013	17.5	
3	5364	18	
3.5	4891	18.5	
4	4861	19	
4.5	4868	19.5	
5	5235	20	
5.5	6176	20.5	
6	6822	21	
6.5	6618	21.5	
7	6005	22	
7.5	5759	22.5	
8	5590	23	
8.5	5973	23.5	
9	6040	24	
9.5	6615	24.5	
10	6623	25	
10.5	6440	25.5	
11	5587	26	
11.5	5653	26.5	
12	5591	27	
12.5	6301	27.5	
13	6203	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002
Technician: Toby Shewan
Instrument Model No.: Ludlum 2221
Operational Check: 20,122
Serial No: 132844
Probe Model No.: PR 44-10
Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.
* Shielded (2")

Boring No.: E-17
Maximum Depth 12 feet 1 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4225	15.5	
1	5486	16	
1.5	6513	16.5	
2	6858	17	
2.5	7242	17.5	
3	6993	18	
3.5	6664	18.5	
4	6668	19	
4.5	6486	19.5	
5	6538	20	
5.5	7608	20.5	
6	9250	21	
6.5	9798	21.5	
7	9993	22	
7.5	8721	22.5	
8	7197	23	
8.5	6132	23.5	
9	5460	24	
9.5	5509	24.5	
10	5573	25	
10.5	5270	25.5	
11	5332	26	
11.5	5581	26.5	
12	5753	27	
12.1	5599	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-18
Maximum Depth 11 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3913	15.5	
1	4516	16	
1.5	4826	16.5	
2	4809	17	
2.5	5065	17.5	
3	5061	18	
3.5	4850	18.5	
4	4805	19	
4.5	4951	19.5	
5	4600	20	
5.5	4316	20.5	
6	3825	21	
6.5	3948	21.5	
7	3999	22	
7.5	4078	22.5	
8	4661	23	
8.5	5235	23.5	
9	5455	24	
9.5	5685	24.5	
10	6501	25	
10.5	7273	25.5	
11	6615	26	
11.5	6148	26.5	
11.8	5715	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-19
Maximum Depth 12 feet 1 inch

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4291	15.5	
1	5435	16	
1.5	5711	16.5	
2	5997	17	
2.5	6038	17.5	
3	5853	18	
3.5	5919	18.5	
4	5690	19	
4.5	5250	19.5	
5	4253	20	
5.5	3664	20.5	
6	3454	21	
6.5	3819	21.5	
7	4361	22	
7.5	4951	22.5	
8	5246	23	
8.5	4893	23.5	
9	5082	24	
9.5	5463	24.5	
10	6442	25	
10.5	6979	25.5	
11	6962	26	
11.5	6492	26.5	
12	6136	27	
12.1	5918	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-20
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2963	15.5	
1	4063	16	
1.5	4816	16.5	
2	4661	17	
2.5	5591	17.5	
3	5981	18	
3.5	5843	18.5	
4	5948	19	
4.5	5415	19.5	
5	5357	20	
5.5	4055	20.5	
6	4621	21	
6.5	4552	21.5	
7	4364	22	
7.5	4053	22.5	
8	4076	23	
8.5	4298	23.5	
9	4340	24	
9.5	4590	24.5	
10	4650	25	
10.5	4533	25.5	
11	4762	26	
11.5	5629	26.5	
12	6277	27	
12.5	6432	27.5	
13	6766	28	
13.5	6862	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-21

Maximum Depth 12 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4378	15.5	
1	5649	16	
1.5	6395	16.5	
2	5985	17	
2.5	5963	17.5	
3	6012	18	
3.5	5839	18.5	
4	5554	19	
4.5	5897	19.5	
5	6247	20	
5.5	5372	20.5	
6	5318	21	
6.5	5305	21.5	
7	5200	22	
7.5	3971	22.5	
8	2909	23	
8.5	2812	23.5	
9	2977	24	
9.5	3250	24.5	
10	3900	25	
10.5	4486	25.5	
11	5495	26	
11.5	6096	26.5	
12	6662	27	
12.4	7092	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-22
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	9621	15.5	
1	22,983	16	
1.5	28,885	16.5	
2	14,789	17	
2.5	8548	17.5	
3	8544	18	
3.5	7862	18.5	
4	7258	19	
4.5	7126	19.5	
5	7022	20	
5.5	8210	20.5	
6	7329	21	
6.5	6625	21.5	
7	5959	22	
7.5	6059	22.5	
8	5414	23	
8.5	4659	23.5	
9	4106	24	
9.5	5582	24.5	
10	5742	25	
10.5	5829	25.5	
11	5416	26	
11.5	5124	26.5	
12	5341	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-23
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	8073	15.5	
1	6217	16	
1.5	4648	16.5	
2	6042	17	
2.5	7459	17.5	
3	9120	18	
3.5	7812	18.5	
4	7658	19	
4.5	7778	19.5	
5	9057	20	
5.5	8388	20.5	
6	8212	21	
6.5	7914	21.5	
7	6883	22	
7.5	6215	22.5	
8	6407	23	
8.5	6417	23.5	
9	6035	24	
9.5	4905	24.5	
10	4771	25	
10.5	5653	25.5	
11	6101	26	
11.5	6614	26.5	
12	6229	27	
12.5	5973	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-24

Maximum Depth 10 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5929	15.5	
1	7057	16	
1.5	7213	16.5	
2	7558	17	
2.5	8706	17.5	
3	8074	18	
3.5	7218	18.5	
4	7736	19	
4.5	7819	19.5	
5	6498	20	
5.5	6537	20.5	
6	7277	21	
6.5	6099	21.5	
7	4687	22	
7.5	4331	22.5	
8	4839	23	
8.5	5422	23.5	
9	5335	24	
9.5	5558	24.5	
10	5743	25	
10.2	5633	25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 4, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,122

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-25

Maximum Depth 11 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	9386	15.5	
1	15,410	16	
1.5	24,502	16.5	
2	49,522	17	
2.5	43,678	17.5	
3	15,849	18	
3.5	6973	18.5	
4	6346	19	
4.5	6257	19.5	
5	6454	20	
5.5	6658	20.5	
6	6165	21	
6.5	6099	21.5	
7	6105	22	
7.5	6402	22.5	
8	6482	23	
8.5	6904	23.5	
9	7201	24	
9.5	7336	24.5	
10	6836	25	
10.5	7056	25.5	
11	7613	26	
11.8	7954	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-26

Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4246	15.5	
1	5456	16	
1.5	6012	16.5	
2	6098	17	
2.5	5912	17.5	
3	6409	18	
3.5	6622	18.5	
4	5768	19	
4.5	5219	19.5	
5	6259	20	
5.5	6040	20.5	
6	5231	21	
6.5	6034	21.5	
7	6443	22	
7.5	6799	22.5	
8	6321	23	
8.5	6335	23.5	
9	6639	24	
9.5	6394	24.5	
10	6254	25	
10.5	6046	25.5	
11	6155	26	
11.5	5994	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-27
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5297	15.5	
1	6120	16	
1.5	5857	16.5	
2	5890	17	
2.5	7445	17.5	
3	6648	18	
3.5	6947	18.5	
4	6745	19	
4.5	6841	19.5	
5	6680	20	
5.5	6032	20.5	
6	6673	21	
6.5	7137	21.5	
7	6838	22	
7.5	6045	22.5	
8	5965	23	
8.5	6359	23.5	
9	7074	24	
9.5	6961	24.5	
10	5737	25	
10.5	5290	25.5	
11	5448	26	
11.5	5499	26.5	
11.10	5383	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002
Technician: Toby Shewan

Instrument Model No.: Ludlum 2221
Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-28

Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5049	15.5	
1	5446	16	
1.5	5702	16.5	
2	6147	17	
2.5	6728	17.5	
3	6940	18	
3.5	6931	18.5	
4	6591	19	
4.5	5840	19.5	
5	5108	20	
5.5	5039	20.5	
6	6638	21	
6.5	7758	21.5	
7	7501	22	
7.5	6095	22.5	
8	5257	23	
8.5	4464	23.5	
9	4467	24	
9.5	4508	24.5	
10	5403	25	
10.5	6155	25.5	
11	6105	26	
11.5	5933	26.5	
11.10	5453	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-29

Maximum Depth 12 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5172	15.5	
1	5546	16	
1.5	4548	16.5	
2	4978	17	
2.5	6499	17.5	
3	6730	18	
3.5	5972	18.5	
4	5368	19	
4.5	6117	19.5	
5	7536	20	
5.5	8282	20.5	
6	7431	21	
6.5	6334	21.5	
7	6400	22	
7.5	6069	22.5	
8	7021	23	
8.5	7589	23.5	
9	7495	24	
9.5	7379	24.5	
10	7466	25	
10.5	7448	25.5	
11	7476	26	
11.5	7726	26.5	
12	8267	27	
12.3	8358	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-30
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	7402	15.5	
1	8715	16	
1.5	9926	16.5	
2	9720	17	
2.5	9267	17.5	
3	8384	18	
3.5	7927	18.5	
4	6163	19	
4.5	4962	19.5	
5	4577	20	
5.5	5772	20.5	
6	6820	21	
6.5	8290	21.5	
7	8638	22	
7.5	8640	22.5	
8	8028	23	
8.5	7289	23.5	
9	7384	24	
9.5	8308	24.5	
10	8214	25	
10.5	8463	25.5	
11	7814	26	
11.5	7035	26.5	
12	6778	27	
12.5	6384	27.5	
13	5816	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-31

Maximum Depth 10 feet 1 inche

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	7888	15.5	
1	10,077	16	
1.5	10,483	16.5	
2	10,530	17	
2.5	10,075	17.5	
3	9390	18	
3.5	7832	18.5	
4	6874	19	
4.5	6275	19.5	
5	6121	20	
5.5	5858	20.5	
6	5767	21	
6.5	5538	21.5	
7	6217	22	
7.5	6393	22.5	
8	6450	23	
8.5	6309	23.5	
9	6235	24	
9.5	6091	24.5	
10	5956	25	
10.1	5898	25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-32
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5509	15.5	
1	5214	16	
1.5	6183	16.5	
2	7310	17	
2.5	7596	17.5	
3	7577	18	
3.5	7324	18.5	
4	7008	19	
4.5	6063	19.5	
5	4971	20	
5.5	4886	20.5	
6	4813	21	
6.5	5487	21.5	
7	5676	22	
7.5	6744	22.5	
8	6998	23	
8.5	6462	23.5	
9	5844	24	
9.5	5835	24.5	
10	5811	25	
10.5	6106	25.5	
11	6526	26	
11.5	7258	26.5	
12	8502	27	
12.5	7830	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-33
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5778	15.5	
1	7636	16	
1.5	6139	16.5	
2	5657	17	
2.5	5059	17.5	
3	8622	18	
3.5	12,816	18.5	
4	12,497	19	
4.5	9553	19.5	
5	7628	20	
5.5	6425	20.5	
6	6461	21	
6.5	6942	21.5	
7	7699	22	
7.5	8216	22.5	
8	7054	23	
8.5	5851	23.5	
9	5256	24	
9.5	5032	24.5	
10	5273	25	
10.5	5566	25.5	
11	5727	26	
11.5	5906	26.5	
12	5934	27	
12.5	6441	27.5	
13	6629	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-34
Maximum Depth 12 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5031	15.5	
1	6064	16	
1.5	5270	16.5	
2	6082	17	
2.5	5905	17.5	
3	6787	18	
3.5	8711	18.5	
4	11,431	19	
4.5	13,234	19.5	
5	7745	20	
5.5	5703	20.5	
6	5310	21	
6.5	5615	21.5	
7	6628	22	
7.5	6467	22.5	
8	5832	23	
8.5	5692	23.5	
9	5859	24	
9.5	6235	24.5	
10	5819	25	
10.5	5434	25.5	
11	5758	26	
11.5	6197	26.5	
12	6666	27	
12.5	7249	27.5	
12.10	7619	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-35

Maximum Depth 11 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5216	15.5	
1	4864	16	
1.5	2915	16.5	
2	3911	17	
2.5	5551	17.5	
3	6231	18	
3.5	6091	18.5	
4	5304	19	
4.5	5794	19.5	
5	5807	20	
5.5	5344	20.5	
6	5020	21	
6.5	5500	21.5	
7	6624	22	
7.5	6852	22.5	
8	6165	23	
8.5	6224	23.5	
9	7054	24	
9.5	7378	24.5	
10	7656	25	
10.5	7500	25.5	
11	6280	26	
11.5	5436	26.5	
11.9	5352	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-36
Maximum Depth 12 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3810	15.5	
1	4288	16	
1.5	4351	16.5	
2	4757	17	
2.5	5412	17.5	
3	5048	18	
3.5	5287	18.5	
4	4839	19	
4.5	4677	19.5	
5	4579	20	
5.5	4496	20.5	
6	4407	21	
6.5	4626	21.5	
7	4519	22	
7.5	4114	22.5	
8	3590	23	
8.5	3750	23.5	
9	4241	24	
9.5	4821	24.5	
10	5159	25	
10.5	5002	25.5	
11	5692	26	
11.5	5841	26.5	
12	5513	27	
12.5	6015	27.5	
12.9	5942	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site

Down Hole Field Log

Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-37

Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3451	15.5	
1	3465	16	
1.5	3655	16.5	
2	4578	17	
2.5	7210	17.5	
3	8364	18	
3.5	7910	18.5	
4	7444	19	
4.5	6461	19.5	
5	5058	20	
5.5	4301	20.5	
6	4582	21	
6.5	4549	21.5	
7	4697	22	
7.5	4392	22.5	
8	4572	23	
8.5	6176	23.5	
9	8135	24	
9.5	8690	24.5	
10	8469	25	
10.5	8085	25.5	
11	8084	26	
11.5	7803	26.5	
12	7477	27	
12.5	7326	27.5	
13	7116	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,372

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-38
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4443	15.5	
1	4394	16	
1.5	4575	16.5	
2	5709	17	
2.5	7033	17.5	
3	7523	18	
3.5	7768	18.5	
4	8923	19	
4.5	9810	19.5	
5	9836	20	
5.5	9660	20.5	
6	8139	21	
6.5	7486	21.5	
7	7428	22	
7.5	7849	22.5	
8	7861	23	
8.5	8102	23.5	
9	8030	24	
9.5	7761	24.5	
10	7203	25	
10.5	7580	25.5	
11	7529	26	
11.5	7532	26.5	
12	8913	27	
12.5	8272	27.5	
13	5447	28	
13.5	4199	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Charles Brown

Instrument Model No.: Ludlum 2221

Operational Check: 2,200

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-39

Maximum Depth 11 feet 7 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2927	15.5	
1	3385	16	
1.5	3616	16.5	
2	4043	17	
2.5	3774	17.5	
3	3701	18	
3.5	3687	18.5	
4	3326	19	
4.5	3367	19.5	
5	4343	20	
5.5	4587	20.5	
6	4334	21	
6.5	4163	21.5	
7	3997	22	
7.5	3978	22.5	
8	4232	23	
8.5	4067	23.5	
9	4167	24	
9.5	5445	24.5	
10	4138	25	
10.5	3493	25.5	
11	3232	26	
11.5	3708	26.5	
11.7	3560	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Charles Brown

Instrument Model No.: Ludlum 2221

Operational Check: 2,200

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-40
Maximum Depth 11 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2930	15.5	
1	3557	16	
1.5	3582	16.5	
2	3463	17	
2.5	3859	17.5	
3	4223	18	
3.5	4378	18.5	
4	4528	19	
4.5	4197	19.5	
5	4058	20	
5.5	3875	20.5	
6	4038	21	
6.5	3649	21.5	
7	3399	22	
7.5	3137	22.5	
8	3134	23	
8.5	3151	23.5	
9	3248	24	
9.5	3213	24.5	
10	3523	25	
10.5	3640	25.5	
11	3464	26	
11.2	3544	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Charles Brown

Instrument Model No.: Ludlum 2221

Operational Check: 2,200

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-41
Maximum Depth 11 feet 7 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2573	15.5	
1	2497	16	
1.5	2648	16.5	
2	4216	17	
2.5	4242	17.5	
3	4173	18	
3.5	4446	18.5	
4	5023	19	
4.5	5467	19.5	
5	5438	20	
5.5	5147	20.5	
6	4921	21	
6.5	4365	21.5	
7	4009	22	
7.5	3639	22.5	
8	3486	23	
8.5	3098	23.5	
9	2905	24	
9.5	2781	24.5	
10	3175	25	
10.5	3639	25.5	
11	4211	26	
11.5	4509	26.5	
11.7	4500	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Charles Brown

Instrument Model No.: Ludlum 2221

Operational Check: 2,200

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-42
Maximum Depth 11 feet 11 iches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2713	15.5	
1	3018	16	
1.5	3143	16.5	
2	2782	17	
2.5	2555	17.5	
3	3235	18	
3.5	3944	18.5	
4	3975	19	
4.5	3518	19.5	
5	3482	20	
5.5	3427	20.5	
6	3598	21	
6.5	3442	21.5	
7	3590	22	
7.5	4102	22.5	
8	4209	23	
8.5	4209	23.5	
9	4103	24	
9.5	4445	24.5	
10	4031	25	
10.5	3519	25.5	
11	3367	26	
11.5	3389	26.5	
11.11	3223	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Charles Brown

Instrument Model No.: Ludlum 2221

Operational Check: 2,200

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-43
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3020	15.5	
1	4133	16	
1.5	3608	16.5	
2	3631	17	
2.5	3453	17.5	
3	3589	18	
3.5	3598	18.5	
4	3522	19	
4.5	3704	19.5	
5	3850	20	
5.5	3592	20.5	
6	3439	21	
6.5	3412	21.5	
7	3248	22	
7.5	3201	22.5	
8	3038	23	
8.5	2837	23.5	
9	2943	24	
9.5	2973	24.5	
10	2919	25	
10.5	2835	25.5	
11	2631	26	
11.5	2458	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Charles Brown

Instrument Model No.: Ludlum 2221

Operational Check: 2,200

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-44
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3482	15.5	
1	4194	16	
1.5	4424	16.5	
2	4391	17	
2.5	4529	17.5	
3	4258	18	
3.5	3914	18.5	
4	4290	19	
4.5	4201	19.5	
5	3982	20	
5.5	4771	20.5	
6	3716	21	
6.5	3533	21.5	
7	3896	22	
7.5	4253	22.5	
8	3694	23	
8.5	3413	23.5	
9	3158	24	
9.5	2943	24.5	
10	2769	25	
10.5	2821	25.5	
11	2915	26	
11.5	2802	26.5	
12	2653	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002
Technician: Toby Shewan
Instrument Model No.: Ludlum 2221
Operational Check: 20,043
Serial No: 132844
Probe Model No.: PR 44-10
Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.
* Shielded (2")

Boring No.: E-45
Maximum Depth 11 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4674	15.5	
1	5206	16	
1.5	6081	16.5	
2	6022	17	
2.5	5663	17.5	
3	5044	18	
3.5	4139	18.5	
4	3518	19	
4.5	3533	19.5	
5	3671	20	
5.5	3546	20.5	
6	3457	21	
6.5	3539	21.5	
7	3512	22	
7.5	3471	22.5	
8	3318	23	
8.5	3373	23.5	
9	2927	24	
9.5	3022	24.5	
10	2758	25	
10.5	2931	25.5	
11	2997	26	
11.5	3114	26.5	
11.11	2966	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,043

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-46
Maximum Depth 11 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3558	15.5	
1	3822	16	
1.5	3705	16.5	
2	3709	17	
2.5	3663	17.5	
3	3672	18	
3.5	3543	18.5	
4	3313	19	
4.5	3314	19.5	
5	3139	20	
5.5	2842	20.5	
6	2708	21	
6.5	2822	21.5	
7	2845	22	
7.5	2896	22.5	
8	2860	23	
8.5	3007	23.5	
9	3060	24	
9.5	3245	24.5	
10	3480	25	
10.5	3990	25.5	
11	3694	26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 16, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,214

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-47
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5299	15.5	
1	4714	16	
1.5	4833	16.5	
2	3539	17	
2.5	4109	17.5	
3	4086	18	
3.5	3374	18.5	
4	3105	19	
4.5	3162	19.5	
5	3802	20	
5.5	5107	20.5	
6	5899	21	
6.5	5364	21.5	
7	5800	22	
7.5	6262	22.5	
8	5939	23	
8.5	6498	23.5	
9	7758	24	
9.5	7120	24.5	
10	6160	25	
10.5	5444	25.5	
11	4961	26	
11.5	4717	26.5	
12	4565	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,043

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-48
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4943	15.5	
1	6634	16	
1.5	9890	16.5	
2	7069	17	
2.5	4500	17.5	
3	4003	18	
3.5	4733	18.5	
4	4422	19	
4.5	6630	19.5	
5	5988	20	
5.5	6336	20.5	
6	7477	21	
6.5	7928	21.5	
7	7154	22	
7.5	4500	22.5	
8	3054	23	
8.5	2755	23.5	
9	2749	24	
9.5	2748	24.5	
10	2599	25	
10.5	2633	25.5	
11	2651	26	
11.5	2826	26.5	
12	3167	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002
Technician: Toby Shewan

Instrument Model No.: Ludlum 2221
Operational Check: 20,043

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-49
Maximum Depth 11 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4356	15.5	
1	4647	16	
1.5	4061	16.5	
2	4682	17	
2.5	4877	17.5	
3	4626	18	
3.5	5381	18.5	
4	4785	19	
4.5	4401	19.5	
5	5295	20	
5.5	5636	20.5	
6	4959	21	
6.5	4544	21.5	
7	5003	22	
7.5	5692	22.5	
8	6733	23	
8.5	7614	23.5	
9	8019	24	
9.5	7773	24.5	
10	6367	25	
10.5	4943	25.5	
11	3602	26	
11.5	2997	26.5	
11.10	2856	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,043

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-50
Maximum Depth 12 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4100	15.5	
1	4547	16	
1.5	3592	16.5	
2	3525	17	
2.5	3374	17.5	
3	4539	18	
3.5	6120	18.5	
4	6806	19	
4.5	7172	19.5	
5	8415	20	
5.5	8585	20.5	
6	8373	21	
6.5	8323	21.5	
7	8143	22	
7.5	7656	22.5	
8	7377	23	
8.5	6707	23.5	
9	6052	24	
9.5	6104	24.5	
10	5661	25	
10.5	5378	25.5	
11	5032	26	
11.5	4711	26.5	
12	4744	27	
12.2	4709	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002
Technician: Toby Shewan
Instrument Model No.: Ludlum 2221
Operational Check: 20,043
Serial No: 132844
Probe Model No.: PR 44-10
Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.
* Shielded (2")

Boring No.: E-51
Maximum Depth 12 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4325	15.5	
1	4788	16	
1.5	5010	16.5	
2	4854	17	
2.5	3765	17.5	
3	4004	18	
3.5	6987	18.5	
4	7426	19	
4.5	7438	19.5	
5	7093	20	
5.5	6950	20.5	
6	7455	21	
6.5	7924	21.5	
7	7609	22	
7.5	6591	22.5	
8	6208	23	
8.5	5298	23.5	
9	4631	24	
9.5	5063	24.5	
10	6275	25	
10.5	8121	25.5	
11	9556	26	
11.5	8981	26.5	
12	7389	27	
12.2	6897	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,043

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-52

Maximum Depth 12 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3969	15.5	
1	4611	16	
1.5	5027	16.5	
2	5019	17	
2.5	4944	17.5	
3	6066	18	
3.5	6237	18.5	
4	6352	19	
4.5	6989	19.5	
5	8637	20	
5.5	7847	20.5	
6	7607	21	
6.5	6499	21.5	
7	5768	22	
7.5	7164	22.5	
8	8326	23	
8.5	7285	23.5	
9	5795	24	
9.5	5007	24.5	
10	4724	25	
10.5	4777	25.5	
11	4963	26	
11.5	5682	26.5	
12	6967	27	
12.5	7570	27.5	
12.11	7836	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,043

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-53

Maximum Depth 12 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4397	15.5	
1	4948	16	
1.5	4702	16.5	
2	4583	17	
2.5	4257	17.5	
3	4251	18	
3.5	4287	18.5	
4	4244	19	
4.5	3823	19.5	
5	4248	20	
5.5	6633	20.5	
6	6590	21	
6.5	4548	21.5	
7	4850	22	
7.5	5533	22.5	
8	6230	23	
8.5	5933	23.5	
9	5188	24	
9.5	4924	24.5	
10	5225	25	
10.5	6343	25.5	
11	6313	26	
11.5	6399	26.5	
12	6958	27	
12.4	6867	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,921

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-54
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2824	15.5	
1	4364	16	
1.5	4329	16.5	
2	4149	17	
2.5	4321	17.5	
3	5383	18	
3.5	5732	18.5	
4	4938	19	
4.5	4030	19.5	
5	3697	20	
5.5	4612	20.5	
6	5766	21	
6.5	6092	21.5	
7	6869	22	
7.5	6709	22.5	
8	5668	23	
8.5	4426	23.5	
9	4174	24	
9.5	4059	24.5	
10	4151	25	
10.5	4300	25.5	
11	5300	26	
11.5	6684	26.5	
12	7820	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,921

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-55
Maximum Depth 12 feet 2 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3468	15.5	
1	4518	16	
1.5	4924	16.5	
2	4551	17	
2.5	5042	17.5	
3	6259	18	
3.5	6466	18.5	
4	7418	19	
4.5	7972	19.5	
5	7274	20	
5.5	6355	20.5	
6	4793	21	
6.5	3830	21.5	
7	3337	22	
7.5	4322	22.5	
8	5457	23	
8.5	5993	23.5	
9	6031	24	
9.5	6082	24.5	
10	6964	25	
10.5	7290	25.5	
11	7379	26	
11.5	7296	26.5	
12	6615	27	
12.2	6493	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,921

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-56
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	6135	15.5	
1	5519	16	
1.5	6217	16.5	
2	7974	17	
2.5	7147	17.5	
3	7377	18	
3.5	7913	18.5	
4	9356	19	
4.5	12,587	19.5	
5	24,581	20	
5.5	62,098	20.5	
6	129,630	21	
6.5	41,346	21.5	
7	14,574	22	
7.5	7194	22.5	
8	4804	23	
8.5	4284	23.5	
9	4434	24	
9.5	4539	24.5	
10	5032	25	
10.5	4676	25.5	
11	6561	26	
11.5	6467	26.5	
12	5358	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-56A
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5690	15.5	
1	5691	16	
1.5	6189	16.5	
2	6556	17	
2.5	7512	17.5	
3	8735	18	
3.5	9818	18.5	
4	10,432	19	
4.5	13,716	19.5	
5	24,070	20	
5.5	57,444	20.5	
6	157,607	21	
6.5	273,156	21.5	
7	119,755	22	
7.5	39,549	22.5	
8	25,419	23	
8.5	30,354	23.5	
9	12,592	24	
9.5	7267	24.5	
10	5431	25	
10.5	5031	25.5	
11	5032	26	
11.5	5274	26.5	
12	5711	27	
12.5	6141	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: (E-56) B
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5663	15.5	
1	4697	16	
1.5	4681	16.5	
2	4665	17	
2.5	5611	17.5	
3	6669	18	
3.5	7619	18.5	
4	7691	19	
4.5	10,127	19.5	
5	12,958	20	
5.5	8731	20.5	
6	6941	21	
6.5	7476	21.5	
7	8372	22	
7.5	8408	22.5	
8	8338	23	
8.5	6737	23.5	
9	6644	24	
9.5	5894	24.5	
10	5161	25	
10.5	4994	25.5	
11	3691	26	
11.5	3022	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002 — Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 — Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 — Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: (E-56) C
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4338	15.5	
1	4665	16	
1.5	5487	16.5	
2	6883	17	
2.5	9182	17.5	
3	10,173	18	
3.5	9649	18.5	
4	8334	19	
4.5	6403	19.5	
5	6406	20	
5.5	6057	20.5	
6	4804	21	
6.5	4614	21.5	
7	4801	22	
7.5	4729	22.5	
8	4317	23	
8.5	4857	23.5	
9	6212	24	
9.5	5854	24.5	
10	6036	25	
10.5	5454	25.5	
11	5481	26	
11.5	5079	26.5	
12	5284	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: (E-56) D
Maximum Depth 13 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3083	15.5	
1	4355	16	
1.5	4677	16.5	
2	4811	17	
2.5	4855	17.5	
3	5888	18	
3.5	6542	18.5	
4	6508	19	
4.5	6587	19.5	
5	6584	20	
5.5	6936	20.5	
6	5923	21	
6.5	6239	21.5	
7	6909	22	
7.5	6771	22.5	
8	6482	23	
8.5	6463	23.5	
9	6312	24	
9.5	6565	24.5	
10	6568	25	
10.5	6048	25.5	
11	6699	26	
11.5	6706	26.5	
12	5978	27	
12.5	5607	27.5	
13	5667	28	
13.5	5673	28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-56E
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3170	15.5	
1	5198	16	
1.5	5679	16.5	
2	5552	17	
2.5	4940	17.5	
3	5031	18	
3.5	6221	18.5	
4	6356	19	
4.5	6534	19.5	
5	6597	20	
5.5	5758	20.5	
6	4833	21	
6.5	5294	21.5	
7	5177	22	
7.5	5733	22.5	
8	6087	23	
8.5	6027	23.5	
9	5696	24	
9.5	5519	24.5	
10	5513	25	
10.5	4581	25.5	
11	4171	26	
11.5	3879	26.5	
12	2975	27	
12.5	2683	27.5	
13	2654	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,921

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-57
Maximum Depth 12 feet 1 inch

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2612	15.5	
1	2743	16	
1.5	3275	16.5	
2	3886	17	
2.5	4190	17.5	
3	4379	18	
3.5	5680	18.5	
4	6511	19	
4.5	7696	19.5	
5	10,004	20	
5.5	10,787	20.5	
6	10,442	21	
6.5	9266	21.5	
7	8570	22	
7.5	8220	22.5	
8	7884	23	
8.5	7412	23.5	
9	7186	24	
9.5	7270	24.5	
10	7197	25	
10.5	6351	25.5	
11	5648	26	
11.5	6318	26.5	
12	6715	27	
12.1	6824	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,921

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-58
Maximum Depth 12 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3363	15.5	
1	4909	16	
1.5	5973	16.5	
2	5765	17	
2.5	5719	17.5	
3	4839	18	
3.5	4719	18.5	
4	4257	19	
4.5	3660	19.5	
5	3123	20	
5.5	4212	20.5	
6	5077	21	
6.5	5710	21.5	
7	5879	22	
7.5	6821	22.5	
8	7976	23	
8.5	8089	23.5	
9	7074	24	
9.5	5384	24.5	
10	3666	25	
10.5	2854	25.5	
11	2692	26	
11.5	2567	26.5	
12	2769	27	
12.5	2909	27.5	
12.9	2842	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,921

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-59
Maximum Depth 11 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2629	15.5	
1	4127	16	
1.5	4698	16.5	
2	4751	17	
2.5	4699	17.5	
3	4787	18	
3.5	4257	18.5	
4	3617	19	
4.5	5671	19.5	
5	5299	20	
5.5	5596	20.5	
6	5501	21	
6.5	4934	21.5	
7	4196	22	
7.5	3384	22.5	
8	2838	23	
8.5	2497	23.5	
9	2860	24	
9.5	3272	24.5	
10	4025	25	
10.5	4439	25.5	
11	4090	26	
11.5	3422	26.5	
11.8	3018	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,921

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-60
Maximum Depth 11 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3013	15.5	
1	4191	16	
1.5	4291	16.5	
2	3800	17	
2.5	4178	17.5	
3	5527	18	
3.5	5984	18.5	
4	6340	19	
4.5	6545	19.5	
5	6266	20	
5.5	6116	20.5	
6	7910	21	
6.5	8070	21.5	
7	6442	22	
7.5	5794	22.5	
8	5801	23	
8.5	6413	23.5	
9	6630	24	
9.5	6164	24.5	
10	5679	25	
10.5	5381	25.5	
11	5275	26	
11.5	5083	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002
Technician: Toby Shewan

Instrument Model No.: Ludlum 2221
Operational Check: 19,921

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-61
Maximum Depth 11 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2872	15.5	
1	4287	16	
1.5	4882	16.5	
2	4765	17	
2.5	5861	17.5	
3	7460	18	
3.5	8645	18.5	
4	7972	19	
4.5	7137	19.5	
5	6940	20	
5.5	7197	20.5	
6	7709	21	
6.5	6893	21.5	
7	7641	22	
7.5	6136	22.5	
8	5257	23	
8.5	4714	23.5	
9	5831	24	
9.5	5325	24.5	
10	3814	25	
10.5	3906	25.5	
11	4495	26	
11.5	5256	26.5	
11.8	5296	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 19,921

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346 | Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-62
Maximum Depth 11 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2535	15.5	
1	3923	16	
1.5	4859	16.5	
2	4721	17	
2.5	5210	17.5	
3	6292	18	
3.5	6595	18.5	
4	6504	19	
4.5	6929	19.5	
5	7302	20	
5.5	7374	20.5	
6	6588	21	
6.5	5089	21.5	
7	4048	22	
7.5	4452	22.5	
8	6020	23	
8.5	6572	23.5	
9	6958	24	
9.5	5817	24.5	
10	6026	25	
10.5	5517	25.5	
11	5224	26	
11.5	5828	26.5	
11.11	5940	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-63
Maximum Depth 12 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2623	15.5	
1	3823	16	
1.5	5409	16.5	
2	5452	17	
2.5	5546	17.5	
3	4965	18	
3.5	5430	18.5	
4	5296	19	
4.5	3699	19.5	
5	4760	20	
5.5	7765	20.5	
6	7492	21	
6.5	7463	21.5	
7	6468	22	
7.5	5839	22.5	
8	5849	23	
8.5	6147	23.5	
9	6289	24	
9.5	5827	24.5	
10	5299	25	
10.5	4637	25.5	
11	4470	26	
11.5	4434	26.5	
12	4701	27	
12.5	5200	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-64
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2799	15.5	
1	4769	16	
1.5	4851	16.5	
2	4988	17	
2.5	4067	17.5	
3	3423	18	
3.5	4345	18.5	
4	4443	19	
4.5	3295	19.5	
5	3416	20	
5.5	3998	20.5	
6	4917	21	
6.5	6784	21.5	
7	5975	22	
7.5	5539	22.5	
8	6272	23	
8.5	6729	23.5	
9	6118	24	
9.5	5561	24.5	
10	5717	25	
10.5	7276	25.5	
11	8196	26	
11.5	8438	26.5	
12	8660	27	
12.5	8800	27.5	
13	8702	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-65
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2672	15.5	
1	4850	16	
1.5	5451	16.5	
2	5286	17	
2.5	5653	17.5	
3	5515	18	
3.5	5501	18.5	
4	6103	19	
4.5	6767	19.5	
5	6800	20	
5.5	6929	20.5	
6	6740	21	
6.5	5801	21.5	
7	4551	22	
7.5	4004	22.5	
8	4910	23	
8.5	4689	23.5	
9	5356	24	
9.5	5623	24.5	
10	6332	25	
10.5	5916	25.5	
11	5469	26	
11.5	5703	26.5	
12	5778	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 19921

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-66
Maximum Depth 11 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4104	15.5	
1	3696	16	
1.5	3883	16.5	
2	4536	17	
2.5	5710	17.5	
3	6437	18	
3.5	7195	18.5	
4	7491	19	
4.5	6932	19.5	
5	7278	20	
5.5	7343	20.5	
6	7498	21	
6.5	7254	21.5	
7	7032	22	
7.5	6848	22.5	
8	7563	23	
8.5	7209	23.5	
9	6968	24	
9.5	6053	24.5	
10	4968	25	
10.5	5376	25.5	
11	5140	26	
11.3	5185	26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-67
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2980	15.5	
1	4441	16	
1.5	4589	16.5	
2	4244	17	
2.5	4330	17.5	
3	5287	18	
3.5	6247	18.5	
4	5908	19	
4.5	5420	19.5	
5	6004	20	
5.5	7364	20.5	
6	8451	21	
6.5	7918	21.5	
7	7155	22	
7.5	7059	22.5	
8	7246	23	
8.5	7913	23.5	
9	7907	24	
9.5	6406	24.5	
10	6183	25	
10.5	5387	25.5	
11	6066	26	
11.5	5986	26.5	
12	5704	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,921

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-68
Maximum Depth 12 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3025	15.5	
1	4299	16	
1.5	4640	16.5	
2	4606	17	
2.5	4966	17.5	
3	4907	18	
3.5	6266	18.5	
4	6341	19	
4.5	5558	19.5	
5	4956	20	
5.5	4016	20.5	
6	3873	21	
6.5	3999	21.5	
7	4824	22	
7.5	5481	22.5	
8	4736	23	
8.5	4276	23.5	
9	4589	24	
9.5	5093	24.5	
10	5906	25	
10.5	4392	25.5	
11	3418	26	
11.5	3661	26.5	
12	3102	27	
12.3	2877	27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Dumas

Instrument Model No.: Ludlum 2221

Operational Check: 28,000

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: E-69
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2775	15.5	
1	3773	16	
1.5	4424	16.5	
2	4765	17	
2.5	6044	17.5	
3	5959	18	
3.5	6052	18.5	
4	5424	19	
4.5	5101	19.5	
5	4892	20	
5.5	4575	20.5	
6	4588	21	
6.5	4635	21.5	
7	4664	22	
7.5	4476	22.5	
8	4474	23	
8.5	3821	23.5	
9	3166	24	
9.5	2941	24.5	
10	2800	25	
10.5	2599	25.5	
11	2634	26	
11.5	2701	26.5	
12	2796	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 18, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,921

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: E-70
Maximum Depth 11 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3750	15.5	
1	5374	16	
1.5	5780	16.5	
2	5603	17	
2.5	5680	17.5	
3	5309	18	
3.5	5103	18.5	
4	7299	19	
4.5	8364	19.5	
5	6885	20	
5.5	5912	20.5	
6	6493	21	
6.5	7005	21.5	
7	7563	22	
7.5	7298	22.5	
8	6961	23	
8.5	6688	23.5	
9	6493	24	
9.5	7448	24.5	
10	7706	25	
10.5	7503	25.5	
11	6664	26	
11.5	8281	26.5	
11.11	9105	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18310

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 100
Maximum Depth 8 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3075	15.5	
1	5118	16	
1.5	7580	16.5	
2	8305	17	
2.5	8693	17.5	
3	8047	18	
3.5	6362	18.5	
4	5767	19	
4.5	6181	19.5	
5	6087	20	
5.5	5253	20.5	
6	5529	21	
6.5	5084	21.5	
7	3906	22	
7.5	3512	22.5	
8	3336	23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002
Technician: Toby Shewan

Instrument Model No.: Ludlum 2221
Operational Check: 18310

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168144
Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 101
Maximum Depth 4 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	5444	15.5	
1	6990	16	
1.5	6536	16.5	
2	3688	17	
2.5	2910	17.5	
3	3134	18	
3.5	4810	18.5	
4	5029	19	
4.5	5237	19.5	
4.10	5707	20	
5.5		20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 18310

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 102
Maximum Depth 4 feet 4 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3583	15.5	
1	3585	16	
1.5	4395	16.5	
2	5291	17	
2.5	5744	17.5	
3	5926	18	
3.5	6919	18.5	
4	7192	19	
4.4	7259	19.5	
5		20	
5.5		20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18310

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 103

Maximum Depth 5 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4832	15.5	
1	6348	16	
1.5	6702	16.5	
2	6777	17	
2.5	7462	17.5	
3	7370	18	
3.5	5192	18.5	
4	3521	19	
4.5	4010	19.5	
5	3417	20	
5.5	3334	20.5	
5.9	3217	21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 18310

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 104
Maximum Depth 4 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3926	15.5	
1	4457	16	
1.5	4516	16.5	
2	4509	17	
2.5	4457	17.5	
3	4514	18	
3.5	4588	18.5	
4	4037	19	
4.5	3135	19.5	
4.9	3148	20	
5.5		20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18310

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 105
Maximum Depth 5 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4548	15.5	
1	5475	16	
1.5	4964	16.5	
2	4881	17	
2.5	4485	17.5	
3	4252	18	
3.5	4227	18.5	
4	3808	19	
4.5	5818	19.5	
5	5730	20	
5.3	6400	20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18310

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 106

Maximum Depth 5 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	6170	15.5	
1	7344	16	
1.5	7397	16.5	
2	6327	17	
2.5	5392	17.5	
3	5312	18	
3.5	5491	18.5	
4	5425	19	
4.5	5294	19.5	
5	4604	20	
5.5	5623	20.5	
5.8	5609	21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18310

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 107

Maximum Depth 5.5 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4246	15.5	
1	4899	16	
1.5	4968	16.5	
2	5706	17	
2.5	6473	17.5	
3	5797	18	
3.5	4010	18.5	
4	3945	19	
4.5	4119	19.5	
5	4421	20	
5.5	4294	20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 2, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 18310

Serial No: 127242

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 108

Maximum Depth 5 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3270	15.5	
1	4466	16	
1.5	4370	16.5	
2	3193	17	
2.5	2454	17.5	
3	2679	18	
3.5	3269	18.5	
4	3001	19	
4.5	2212	19.5	
5	2946	20	
5.5	3419	20.5	
5.10	3299	21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Charles Brown

Instrument Model No.: Ludlum 2221

Operational Check: 2,200

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: 109

Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2635	15.5	
1	3097	16	
1.5	3383	16.5	
2	3713	17	
2.5	3605	17.5	
3	3893	18	
3.5	4032	18.5	
4	4928	19	
4.5	6298	19.5	
5	6521	20	
5.5	4738	20.5	
6	4569	21	
6.5	4901	21.5	
7	5364	22	
7.5	4918	22.5	
8	5431	23	
8.5	6496	23.5	
9	6730	24	
9.5	6749	24.5	
10	6919	25	
10.5	7164	25.5	
11	7853	26	
11.5	8364	26.5	
12	9039	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Charles Brown

Instrument Model No.: Ludlum 2221

Operational Check: 2,200

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: 110
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3512	15.5	
1	4240	16	
1.5	4934	16.5	
2	5699	17	
2.5	6298	17.5	
3	5662	18	
3.5	5758	18.5	
4	7745	19	
4.5	8538	19.5	
5	8973	20	
5.5	8981	20.5	
6	8531	21	
6.5	7575	21.5	
7	7366	22	
7.5	7370	22.5	
8	7559	23	
8.5	7732	23.5	
9	7405	24	
9.5	6822	24.5	
10	6136	25	
10.5	5078	25.5	
11	4708	26	
11.5	4989	26.5	
12	5101	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 7, 2002

Technician: Charles Brown

Instrument Model No.: Ludlum 2221

Operational Check: 2,200

Serial No: 176944

Probe Model No.: PR 44-10

Serial No.: 182346

Cutoff Value = 7.2 pCi/gm = 15,894 counts per 30 sec.

* Shielded (1")

Boring No.: 111
Maximum Depth 12 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3262	15.5	
1	4255	16	
1.5	4350	16.5	
2	4014	17	
2.5	3650	17.5	
3	3232	18	
3.5	3062	18.5	
4	3346	19	
4.5	3411	19.5	
5	3303	20	
5.5	3339	20.5	
6	3765	21	
6.5	3795	21.5	
7	3513	22	
7.5	3444	22.5	
8	3227	23	
8.5	3314	23.5	
9	3062	24	
9.5	2453	24.5	
10	2097	25	
10.5	2590	25.5	
11	3620	26	
11.5	5727	26.5	
12	7566	27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 8, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20,043

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 112
Maximum Depth 13 feet

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4104	15.5	
1	4565	16	
1.5	4698	16.5	
2	4973	17	
2.5	5939	17.5	
3	5403	18	
3.5	4340	18.5	
4	4044	19	
4.5	3510	19.5	
5	3960	20	
5.5	4106	20.5	
6	3743	21	
6.5	3492	21.5	
7	3542	22	
7.5	3655	22.5	
8	3726	23	
8.5	4209	23.5	
9	5530	24	
9.5	655	24.5	
10	6976	25	
10.5	7444	25.5	
11	7198	26	
11.5	6507	26.5	
12	5834	27	
12.5	5226	27.5	
13	4125	28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 9, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,900

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: B-113
Maximum Depth 7 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4040	15.5	
1	5041	16	
1.5	5088	16.5	
2	5243	17	
2.5	4757	17.5	
3	4232	18	
3.5	3879	18.5	
4	3871	19	
4.5	4566	19.5	
5	5411	20	
5.5	5768	20.5	
6	5385	21	
6.5	5204	21.5	
7	4614	22	
7.5	4434	22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 9, 2002 | Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 | Operational Check: 19,900

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 | Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: B-114
Maximum Depth 5 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	4194	15.5	
1	4713	16	
1.5	4759	16.5	
2	5148	17	
2.5	6058	17.5	
3	5790	18	
3.5	3730	18.5	
4	2436	19	
4.5	2401	19.5	
5	3203	20	
5.3	3622	20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 9, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,900

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: B-115
Maximum Depth 8 feet 8 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3822	15.5	
1	3812	16	
1.5	3013	16.5	
2	3446	17	
2.5	3722	17.5	
3	4086	18	
3.5	4415	18.5	
4	4364	19	
4.5	3284	19.5	
5	3238	20	
5.5	4300	20.5	
6	4830	21	
6.5	4932	21.5	
7	4835	22	
7.5	4638	22.5	
8	4546	23	
8.5	4656	23.5	
8.8	4863	24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 9, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 19,900

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: B-116
Maximum Depth 4 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3531	15.5	
1	3256	16	
1.5	4944	16.5	
2	6253	17	
2.5	6832	17.5	
3	6827	18	
3.5	7518	18.5	
4	6270	19	
4.5	5371	19.5	
4.11	5991	20	
5.5		20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 117
Maximum Depth 6 feet 10 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2548	15.5	
1	3836	16	
1.5	4925	16.5	
2	5175	17	
2.5	4877	17.5	
3	4993	18	
3.5	4618	18.5	
4	3490	19	
4.5	2802	19.5	
5	5845	20	
5.5	9139	20.5	
6	8204	21	
6.5	6825	21.5	
6.10	5626	22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 118
Maximum Depth 6 feet 11 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2938	15.5	
1	4865	16	
1.5	5743	16.5	
2	6181	17	
2.5	5481	17.5	
3	4396	18	
3.5	3801	18.5	
4	2833	19	
4.5	4277	19.5	
5	6665	20	
5.5	6871	20.5	
6	6873	21	
6.5	6360	21.5	
6.11	6121	22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 119
Maximum Depth 6 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2708	15.5	
1	3596	16	
1.5	4217	16.5	
2	4280	17	
2.5	4440	17.5	
3	4275	18	
3.5	4496	18.5	
4	5482	19	
4.5	5096	19.5	
5	5709	20	
5.5	5251	20.5	
6	4883	21	
6.5	5824	21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002 Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 120
Maximum Depth 6 feet 9 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2883	15.5	
1	4672	16	
1.5	5850	16.5	
2	6609	17	
2.5	6619	17.5	
3	6629	18	
3.5	5436	18.5	
4	5837	19	
4.5	6220	19.5	
5	5625	20	
5.5	4774	20.5	
6	5477	21	
6.5	6251	21.5	
6.9	6391	22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002

Technician: Toby Shewan

Instrument Model No.: Ludlum 2221

Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144

Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 121
Maximum Depth 5 feet 5 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	2496	15.5	
1	4329	16	
1.5	5777	16.5	
2	5956	17	
2.5	5595	17.5	
3	4213	18	
3.5	3625	18.5	
4	4482	19	
4.5	5214	19.5	
5	4028	20	
5.5	2739	20.5	
6		21	
6.5		21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Lakeshore East Site
Down Hole Field Log
Project No. 32193ZH

Date: January 21, 2002 — Technician: Toby Shewan

Instrument Model No.: Ludlum 2221 — Operational Check: 20013

Serial No: 132844

Probe Model No.: PR 44-10

Serial No.: 168144 — Cutoff Value = 7.2 pCi/gm = 18,059 counts per 30 sec.

* Shielded (2")

Boring No.: 122
Maximum Depth 6 feet 3 inches

Depth – FEET	Counts per 30 Seconds	Depth – FEET	Counts per 30 Seconds
0.5	3109	15.5	
1	4653	16	
1.5	5112	16.5	
2	5882	17	
2.5	7151	17.5	
3	6827	18	
3.5	6196	18.5	
4	4880	19	
4.5	4799	19.5	
5	4738	20	
5.5	4448	20.5	
6	3377	21	
6.3	3848	21.5	
7		22	
7.5		22.5	
8		23	
8.5		23.5	
9		24	
9.5		24.5	
10		25	
10.5		25.5	
11		26	
11.5		26.5	
12		27	
12.5		27.5	
13		28	
13.5		28.5	
14		29	
14.5		29.5	
15		30	

Attachment C

Impacted Soil Locations GPS Station References

Attachment C

GPS Coordinates of Impacted Borings
Downhole Logging

D-34	N-4637400.9	E-448771.2
D-10	N-4637400.4	E-448804.2
D-94	N-4637425.6	E-448808.5
D-125	N-4637436.2	E-448898.3
D-71	N-4637414.2	E-448869.9
D-77	N-4637412.8	E448923.3
E-56	N-4637271.3	E-448874.9

GPS Coordinates of the Impacted Areas, Surface Survey (September 19, 2001)

SS.5-50.5	N-4637456.9	E-448830.8	QQ-66	N-4637441.9	E-448900.8
OO.5-52	N-4637486.1	E-448826.0	H-45	N-4637262.8	E-448819.1
PP.5-59	N-4637441.3	E-448863.7	G-51	N-4637271.0	E-448825.9
MM-66	N-4637425.5	E-448893.9	LL-59	N-4637423.5	E-448864.9